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CONTENTS

NUCLEAR POWER

ELECTRIFICATION OF THE BAYKAL-AMUR LINE

Moscow PRAVDA in Russian 10 Oct 82

[10 Oct 82 p 2 Part I]

[Part One of article by special PRAVDA correspondent S. Bogatko: "In Line with the Resolutions of the 26th CPSU Congress: Power for the BAM"]

> [Text] "Continue work on the further expansion of the nation's Unified Power System, and improving the reliability and quality of the electrical power supply for the national economy".
>
> (From the "Main Trends of USSR Economic and Social Development for 1981-1985 and the Period up to 1990").

1. High Voltage

An event will take place in the fall of 1984 which will undoubtedly be written in red letters in the history of Siberia: through working train traffic will open up over the entire length of the Baykal-Amur trunk line from Ust'-Kut to Komsomol'sk-na-Amur. This will be quite timely. The fact is that the Transsiberian line is overloaded and it is not easy with it to cope with the cargo flows which are increasing year by year.

And there is yet another event, perhaps no less significant which is anticipated at the end of the present five-year plan. The Far East power grid will be tied into the USSR Unified Power System. The joining will be accomplished in two directions. At first, the lines being built parallel to the BAM [Baykal-Amur Trunk Line] will be tied in, and then those along the Transsiberian Line (obviously, in 1986). Thus, the control dispatcher for the USSR Unified Power System will be able to control from his console power capacities from Vladivostok to Brest - over a span of eight time zones.

The influx of fresh electrical power will rejuvenate the old Transsiberian Line. Trains with electric drives will travel the section from Chita to Khabarovsk several hours faster than now. The introduction of recuperative braking will yield a considerable savings of fuel. On the long downhill grades which the Transbaykal and area near the Amur are famous for, electric locomotives will operate as generators, transmitting power into the grid. And this is no small item. The machinists on electric locomotives are right now returning more than 1 million kilowatt hours annually in the nation.

For the nation's eastern regions which have enormous fuel resources, the key trends are the development of high capacity electrical power engineering facilities, energy intensive production operations, the introduction of labor saving technology . . . . Scientists and planners so often repeat this axiom and so convincingly demonstrate the effectiveness of the utilization of Siberia's fuel and energy potential that an impression is very likely being created that there exists a profusion of power there or in any case, everything is well-off in this regard.

I had occasion to visit many cities of the Far East and meet with scientists, economists, control dispatchers for the power grids, as well as party and management workers involved with the problems of the region's power engineering. They confirmed the fact: it is all true if the issue is one of plans and possibilities, but not one of present day practice.

The neighboring region of Eastern Siberia is experiencing a constant sharp shortfall of electrical power. And yes, this is the very area where the largest hydroelectrical power stations in the world are operating: the Krasnoyarskaya, Sayano-Shushenskaya, Bratskaya, Ust'-Ilimskaya. . . .

As far as the Far East is concerned, the situation here is even more complex. Over an area occupying about a third of the nation's territory, not only is no more electric power being produced and consumed per capita (by the way, the area having the smallest population), as follows from the main "Siberian formula", but on the contrary, less power is being generated and consumed than on the average for the nation. This means that in industry and agriculture, the growth of labor mechanization is being held up. The kolkhozes and sovkhozes are forced to expend an enormous amount of valuable liquid fuel and retain a large staff of mechanics and electricians.

Up until now, machine building has provided the lion's share of industrial production in the Far East; this is a sector which is labor intensive but less sensitive to an energy shortfall. The mining and metallurgical industry does not occupy second or even third place. . . The BAM promises to shake up this unsiberian proportion. This will be the area of operation of large machines and high capacity production process flows which extract fuel, ore and other useful minerals from the earth. But a very great deal of power is needed for this.

And as yet, the Far East power grid bears the mighty name of Integrated primarily in an administrative sense. It operates independently and consists of several isolated or poorly tied together systems, so that it is not capable of maneuvering its capacities, which is being used so effectively by 700 hydroelectric, state regional and nuclear electric power stations operating as part of the USSR Unified Power System. The regional systems here can anticipate assistance from nowhere. The decentralization of "support points" and consumers is quite great. For this reason, cases of forced and even sudden shutdowns of the power supply are not uncommon.

No small amount has been done in recent years to avoid the exacerbation of the power deficit in the nation's east. It is planned that during the 11th Five-Year Plan, large power supply centers will be constructed. The most important

"support points" in the Transbaykal will be the Kharanorskaya and Gusinoozerskaya GRES's, in the east it will be the Primorskaya GRES and in the north the Kolymskaya and Vilyuyskaya GES's while for the BAM, it will be the Neryungrinskaya GRES. Moreover, central heat and electric power stations are being built in many cities to provide heat and electricity to new microregions and production facilities. The Zeyskaya GES which is in the stage of being finally completed and the Bureyskaya GES occupy an important place in this encouraging list. But they are a special topic of conversation.

The "little BAM" went on line not so long ago. In October of 1978, the rails were brought up to the largest coal deposits, and from the very first hours of contact, special trains of fuel went to the Tynda. The Yuzhno-Yakutsk territorial production complex, the first one in the BAM region, is being opened up with ever larger turnovers. It incorporates the Neryungrinskaya GRES, which in the immediate future will be assigned the role of the major power source both for the complex and for the entire central BAM.

The Yuzhno-Yakutsk territorial production complex has survived a difficult time. Just a year ago, the outlook at Berkakit and at Neryungry was extremely gloomy. In the winter from an airplane, the settlements seemed to be enormous black spots: the snow all around was covered with a thick layer of soot. The Yakutsk coal, which in terms of its BTU content is on a par with kerosene, had one unfavorable property: it cannot be completely burned in small furnaces, while its dust is so greasy that precipitating it out by the usual method, using water, proved to be impossible: the water droplets immediately roll up and run off. The boiler rooms were black from the dust.

And here at the outset of the previous winter a central district heating station was started in operation. Initially, doubting the reliability of the coal pulverizers, they stocked up with scarce fuel oil: they were really sick and tired of swallowing the bitter smoke. But the misgivings proved to be in vain. The same greasy dust now roars cheerfully and evenly in the furnace combustion chambers, and the greater the furnace capacity, the better this coal burns. The noble white smoke rises weightlessly above the smokestack. The sky over the city has cleared and the air has been cleaned up. The youth now go with pleasure to the "water heater", and to intellectual work with machines and instruments. Some 400 formers stokers have been fixed up with cleaner and more interesting work. Heat immediately came into the homes and for the first time the Yakut winter did not turn out to be quite so endless.

Difficult problems also confronted the builders of the Neryungrinskaya GRES: the permafrost, high seismicity, lack of water in the winter. . . it was necessary to combine the forces of several ministries in resolving the priority problems. The municipal and oblast party committees overcame the striving of some departments to sit on the fence, to make do with what was already prepared. The start-up of the first plant with a capacity of 210,000 kilowatts was planned for the end of 1983. But considering the appetites of consumers, the decision was made to bring it on line a half a year earlier.

It was then and is now clear that the first stage of the GRES, 630,000 kilowatts, will not suffice for long. The capacities must be built up. It would seem, and

this is plainer, that the fuel resources are enormous here. The reserves of coal in Southern Yakut are figured in tens of billions of tons. But this is once again outside the range of possibilities. The actual fuel which will be extracted from the open pit mines under construction here today has already been entirely scheduled for the electric power stations. Engineers are now looking for reserves, two million tons annually, so as to boost the capacity of the Neryungrinskaya GRES up to 1.2 million kilowatts. If metallurgical production operations are to be expanded here, a new "turn" must be taken in fuel extraction: the construction of new open pit coal mines and the boosting of the power capacity of the territorial production complex up to 2.4 million, and perhaps even up to 4.8 million kilowatts.

But these are the long term prospects. Power transmission lines rated at 220 KV are as yet being constructed along the entire route of the BAM. Only the linking-up of the Severo-Muyskiy tunnel construction project has made it possible to free 300 gasoline tankers. But while the BAM workers were nonetheless able to do a significant and most difficult part of their work without a centralized power supply, the industrial development of the BAM region based on "Zhivul'kakh" is simply impossible. In this case, the power system which operates under conditions of snowfalls, avalanches, flash floods and icing must absolutely be encircled, as for example, Tynda, which will be safeguarded from four directions.

In our time, a disconnection of the electric power is compared with a hurricane, earthquake, flooding and other massive natural calamities. And this is no exaggeration. In the winter, in any region east of the Urals, if the boiler is shut down, in two hours the heating system will change into a lump of metal: all of the pipes will have to be taken out and new ones put in. The residents must be immediate evacuated from their housing. For the Solnechnyy ore enrichment combine, for example, a "pause" of just one minute is turned into the loss of the day's production. The situation in the cellulose and paper, and electrometallurgical production operations is also not inexpensive. To deenergize a modern agricultural complex means to cause a sharp reduction in milk yield as well as a loss of poultry and cattle disease.

Moreover, the power generating capacities of the Far East are loaded so much that even in the summer, one has difficulty in stealing the time for preventive maintenance of the equipment. Only in the Komsomol'sk-na-Amur region has the industrial potential doubled over the past two five-year plans.

The workers of the Far East are making the utmost efforts to untie the knot of power engineering problems. In the past year, the Khabarovsk kray party committee mobilized all resources to speed up the construction of the Khabarovsk--Komsomol'sk-na-Amur 220 KV power transmission line. Each region was assigned a section of the route: paths were cut through forests, roads were built, concrete was poured and supports were set up. A special award to be worn on the chest was approved: "For Shock Labor in the Construction of the Power Transmission Line". . . the people worked from sunrise to sunset and at night by the light of lanterns. In waterproof suits up to their waists in ice water they set up supports. Every days tens of vehicles, bulldozers and boats went out on the route. Helicopters operated for thousands of hours in the air. . .

The people have accomplished a great feat, placing the 220 KV power transmission line in service ahead of schedule. But there is no need to explain that the "People's Construction Project" method was due to extreme necessity, and the expenditures were quite high. It was necessary to undertake a new even more intensive labor effort in the present year, and new assignments have followed. A 500 KV power transmission line is being built, which should connect Khabarovsk to the most important source of power, the Zeyskaya GES. Workers from Bratsk, Irkutsk, Krasnoyarsk and Tyumen' have come to the aid of the Far East workers.

There is no doubt that this vitally important power bridge will be constructed and placed in service on time. The situation has eased somewhat. But how much power does the Zeyskaya have in reserve and how can this "support point" put off the threat of a new power deficit? More on this in the next article.

Moscow PRAVDA in Russian 11 Oct 82

[11 Oct 82 p 2 Part II]

[Conclusion of article started in PRAVDA, 10 Oct 82 by Special Correspondent S. Bogatko: "In Line with the Resolutions of the 26th CPSU Congress: Power for the BAM"]

[Text] 2. The Zeya, The Bureya. . .

There is a fundamental specific feature in the development of the hydroelectric power engineering of the Far East. Here the hydroelectric power facilities not only do not reduce the useful land area, but on the contrary, increase it. During the period of the summer and autumn monsoons, large devastating floods are frequently produced in the Amur basin. For this reason, the problem of regulating the water conditions remains an exceptionally urgent one here.

Now, when energy has come to the center of attention, this is difficult to imagine, but as early as 30 years ago it was planned that not a GES would be built at the Zeyskiye Vorota, but rather a simple dam with a single purpose: protection against flooding. It was figured then that the energy of the turbines would have nowhere to go, since the economy of the Priamur region was poorly developed.

But then the Zeyskaya GES was built. Besides the avalanche of electricity, it has made it possible to set about the mastery of new hundreds of thousands of hectares of fruitful land, on which farming was previously risky and unprofitable. And there are still many economically advantageous and ecologically useful waterworks which must be constructed in the Amur basin.

The flood which enveloped many regions of the Khabarovsk kray last year reminded us of this once again. Considerable losses were incurred by farms whose lands were located in the valley of the Lower Amur. The eastern section of the BAM [Baykal-Amur Trunk Line] was also subjected to a shock. Although the consequences of the flooding were eliminated, admittedly I heard with considerable unease the words of one "very well informed" fellow traveler on the road that the Zeyskaya hydraulic development barely stood the pressure of the elements, and the bottom floodgates were apparently even torn away and are now being restored there. . . did the design calculations really prove to be incorrect?!

When I asked the chief of "Zeyagesstroya", Hero of Socialist Labor, A.M. Shokhin, he literally exploded with indignation:

"Nonsense! The fact is we are praying every year for a high water such as occurred in 1972. We will take any flooding - and the greater it is the better. Please: the dam is built, the basin is ready and the turbines, all six of them are waiting. There is no way we can collect even the minimum volume. We also still have dry holes in the permanent water intake and there is not enough water for the city. A flood will come without fail, such is the climate here, but we want it to come very soon. Nature is somewhat slow, as if on purpose. We are tired of trembling about each cubic meter of water which we are forced to take from the emergency reserve, from the Neptune of the Zeya. Unfortunately, the heavy rains of past years have fallen on the basins of the Ussuri and Bira Rivers, not where they are needed, but where are no regulating facilities. We followed the track of the monsoon on the weather maps and called him: Turn towards us. . . "

I recalled the alarming summer of 1972 when the residents of the Priamur did not turn their radios off either day or night, listening to reports on the water level in the Zeya River, listening to the instructions of the flood commissions, which were given emergency powers. The dam which was under construction and the city of Zeya were successfully defended then in a tense battle, but tens of settlements were flooded and a considerable portion of the harvest was lost. And while all of the cattle were saved, since there was time to drive them up into the hills, the washed-out roads, destroyed bridges, houses and ruined poultry farms were a sad picture. The losses were figured in millions of rubles. An even more threatening situation was created in 1928 when the city of Zeya was destroyed by a flood, and steamships navigated the streets of Blagoveshchensk. One must be quite brave to undergo flooding on the Zeya.

This conversation with A.M. Shokhin took place in April of this year. And imagine: in the first days of August on the Zeya it started. . . the flood shaped up exactly as it did in 1972. But now below the dam, before the confluence of the Selemdzha, no one at all felt the flooding while the power engineers were glad, congratulated one another on "Neptune's holiday". In fact, on August 11th, the water level in the "sea" reached the long awaited marker - the reserve section of the water reservoir. The water influx amounted to about seven cubic kilometers. But this is little to power engineers. They say: this winter it will nonetheless be necessary to borrow from Neptune; three to four more such floods, 26 cubic kilometers are needed to see that the GES operates with the greatest efficiency. That which ten years ago was an awful disaster is now going for good because of the work of the people.

The Far East hydroelectric power builders must be given their due: they proved to be not only worthy recipients of the traditions of Dneproges, Bratsk and Krasnoyarsk, but also tried not to repeat their mistakes. Both the GES and the basin of the water reservoir, as well as the settlement of power engineering workers - all are being turned over to the operational workers in excellent condition. Our public spirited approach is no small criticism of those builders who in a hurry have left uncleared forest in the area to be flooded. And it serves them right! You see, 4.1 million cubic meters of timber was taken out

of the flooded area on the Zeya. The Zeyskaya "sea" is the cleanest, and therefore the period of natural biological restructuring will probably go relatively easily.

The Kvyatkovskiy diagonal type turbines operate excellently at any water level. But the greater the pressure head, the greater the power output of each machine. While with a low pressure head, it is necessary to pass six cubic meters of water through a turbine to generate each kilowatt-hour, at the normal level of the "sea", three cubic meters will be enough. For this reason, both on the Zeya and in Khabarovsk, in the dispatcher control center of the power system, they are now striving to economize on water, for this is essentially the same thing as coal. Coal for which one does not have to go down into the bowels of the earth, coal which does not have to be rolled over the rails and burned in furnaces.

It is especially important to accumulate as much water as possible in the winter. But it is difficult to save: the demand is rising. A 500 KV power transmission line will soon be built which will link Zeya to Khabarovsk. The Priamur residents and the BAM workers wait for this moment with outspoken anxiety. Which will be ahead: the level of the "sea" or the level of consumption?

The appearance of the Zeyskaya GES on the economic map of the Far East took place in the happiest fashion. It appeared at the requisite point and at the appropriate moment: right in the very center of the loads. Its role has become a decisive one in the power system. But planners foresee a stormy future development for the productive forces of the region and have planned in step with the freeing of people and equipment on the Zeya to transfer them to the Bureya, continually building up the forces there. The situation is similar: there is both the necessity of combating the furious floods and there is a high capacity power potential.

The hydraulic development on the Bureya has been planned to be even more effective. Upstream, at the Talakanskiy section line, the first landing of builders took place immediately after the start of the first turbine on the Zeya in 1975. During this time, a base has been created on the Bureya: roads, settlements, shops and garages have built. This year, power from the Zeya will go to the section line of the Bureyskaya GES via a 220 KV power transmission line. The basic collective of builders has been put together there, more than a thousand persons.

But although the time has not expended in vain, there has not been a smooth transfer of personnel from the Zeya to the Bureya. Questions related to the construction of the Bureyskaya GES are being resolved too slowly, and as a result, the "Zeyagesstroy" administration has lost many highly skilled workers and engineers and also fallen off the pace. In particular, disagreements have arisen among specialists of the USSR Ministry of Energy concerning the construction of the GES.

As is well known, the most important question for the Far East is the saving of human labor; the Achilles heel for hydroelectric power construction is the excessively long timeframes for the construction of the dams. Over those years

which have gone for the overall preparatory work and in arguments concerning financing, the Far East workers developed a new and unique variant for the hydraulic development. Its major principles are: for the same cost, without reducing the reliability and efficiency of the development, the timeframes for the construction of the facility are reduced by a year and a half, the level of mechanization of the construction work is sharply increased and the labor outlays are reduced. For this, techniques of layer by layer concrete pouring are being worked out at a test facility close to the Zeyskiye Vorota. There is nothing surprising: life goes on and new engineering design solutions appear. However, the project planners obviously feel that they have been offended.

Without entering into a professional argument, it is nonetheless necessary to recall that serious changes were made more than once in the project plan in the construction of the Zeyskaya GES, and a considerable amount which was new and progressive was implemented there. In this case, the specialists here have proved to be right on all points. They have been able to organize close creative cooperation both with scientists and the supply plants, have done their own work in better form and not once let the project down. So why not continue to show confidence in them and why not authorize the utilization of the best experience in domestic hydroelectric construction - the experience from the Toktogul'skaya and other GES's? In doing the construction work using the new variant, power can be produced not in 1990, but in 1998. And this means additional energy and the freeing of people for new construction projects, and what is altogether probable, one intercepted flood.

The situation with energy in the Far East has come about so that a shortfall will be felt as early as 1984, and by 1990, hardly any other power generation facility, with the exception of the Bureyskaya complex, will be able to keep the kray economy from avoiding an electric power shortfall. There is still time right now to correct the situation, but only just enough time for this.

Similar problems also confront the power engineers of the Northeast. The first hydraulic turbine has been brought on line on the Kolyma, and as on the Zeya it is a diagonal type. If one considers the difficulties in delivering fuel here, this GES will save several millions of rubles annually. Not long in Magadan, in the five story buildings, in order to prepare dinner or take a bath, the residents stoked the furnaces with firewood; now the installation of electrical furnaces is permitted.

They say that people go to the coal regions unwillingly. But a strong collective has been put together at the Kolymskaya GES and foremen who are good at their work and used to the north have been brought together. And again, as from the Bureya: a gradual transition to the construction of the Ust'-Srednekanskaya GES was planned; and again there is the vexing ambiguity, the delay in the resolution of problems. And without seeing the long term prospects, the Kolyma workers are already planning to set out; they have ordered 800 containers. And when the construction of the Ust'-Srednekanskaya GES really begins, it will be necessary to undertake a new burst of labor there.

The prospects for the construction of the Amguemskaya GES on the Chukotka are also unclear. It is small, but the station is not there yet and it is necessary to annually ship a large amount of solar oil in. A decision is awaited concerning the stormy Vitim, where the rails of the BAM should soon arrive. The Selemdzha, an unruly heavy water flow tributary of the Zeya, will not calm by itself.

The Zeyskaya GES dam has turned its bright face to the south. The winters here are freezing cold, but in terms of the number of sunny days, the Priamur area is almost equal to the Crimea. The sun here is so strong that the rubber washers of the enormous windows of the hydroelectric power station building dry out. For the end face wall of the Zeyskaya GES, Leningrad artists have come up with a special decoration: vertical sundials. For in essence it is not the water which turns the turbines, but the sun. These clocks do not show the zone time but rather the true time. Time which should work for us not just on the Zeya. . .

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NUCLEAR POWER

ROSTOVSKAYA AES CONSTRUCTION REPORT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Oct 82 p 1

[Article by V. Aksenov, Volgodonsk: "The Deadlines Are Set and . . . Not Met"]

[Text] Eight o'clock in the morning. According to the schedule, the last bus should be stopping at the final stop at the dispatcher control point for the "Atomenergostroy" construction administration and the management building for the Rostovskaya AES which is under construction. The main dispatcher, V. Yurlagin looks at the clock:

"There are still six buses out. And that is about 500 people."

On this day, the last bus arrived at the construction site only at 11:00 o'clock. For each hour of delay by one bus, 80 man-hours are lost at the construction project. Nobody knows how much time is wasted in all because of the failure to deliver people on time to the work site.

At the request of the correspondent's office of SOTSIALISTICHESKAYA INDUSTRIYA, the Volgodonsk municipal people's control committee made a surprise inspection and determined that for this reason, some 250 to 300 man-hours are lost daily at the construction site. And how much health is lost and how much nervous tension is occasioned by this bus epic!

"This is not our fault," says the deputy director of the nuclear electric power station, V. Ionov, "The transportation of personnel is the business of the builders. We pay the transportation expenses, for which 6.5 million rubles have been allocated."

The deputy manager of the "Volgodonskenergostroy" trust, R. Usatyy, is more precise:

"The USSR Ministry of Energy has not set up a passenger motor vehicle transportation enterprise at the base of the trust in Volgodonsk, and this is why the municipal administration should take on itself the concern for the transportation of the builders."

"Without supplementing the vehicle fleet and given the present day roads, we are not able to provide for the delivery of the people," admits the director of the municipal motor vehicle transportation enterprise, N. Bezuglov.

The situation has been correctly evaluated. The entire affair rests on the garage, which has become a unique kind of monument to the dragged out construction, lack of coordination between all of the interested parties and the most basic mismanagement. Various deadlines have been set for placing it in operation: 1979, 1980 and 1981. Yet another deadline, the fourth quarter, has been set for this year. The first month of the last quarter is underway and the end of construction is not in sight. The last approved schedule provided for the completion of work on 120 places by September. Two-thirds have not been turned over for service. Instead of 300 persons, about 100 are working at the construction site; there are constant interruptions in the deliveries of construction materials, structures and mechanisms.

The decisions of not only the operational conferences which are held by the administrative chief V. Deyneg, but also the instructions of the oblast staff have a hollow ring. The chairman of the Rostov oblast executive committee, N. Ivanitskiy, held a conference especially concerning the construction of the garage. One deputy manager of the "Volgodonskenergostroy" trust, V. Bunin, was assigned the job of assuring the timely delivery of construction materials for the garage facilities and another, R. Usatyy, was to assign machinery to the construction project.

Almost half a year has passed, but the deputy managers of the trust have not carried out the assignments given them. And no one asks them about this.

They frequently talk about the garage in Volgodonsk. There has not been a single conference or meeting where its importance has not been mentioned. At almost every meeting of the oblast staff for the construction of the Volgodonsk power complex, and more than forty of them have already been held, the talk is of the construction of the garage; each time, the manager of the trust Yu. Chechin makes assurances that, he says, "We will correct the matter". But as is well known, nothing is improved by any of these words.

The customers, the "Atommash" production association and the municipal motor vehicle transportation enterprise, are also given occasion to drag out the work. For the most diverse reasons, equipment does not arrive on time at the construction site, and at times the equipment is even unnecessary.

The chief of the Rostov "Sevkavkomplektoborudovaniye" administration, V. Tokarev, forgot to mention that the garage in Volgodonsk was yet to be turned over for use, while the Soyuzglavavtosel'mash [main administration for motor vehicles and agricultural machinery] with the USSR Gossnab [State Committee for Material and Technical Supply] (the chief is A. Kovyrkov) did not approve the complete list. It was necessary to send out couriers in various directions. And far from every trip produced any results.

And while a judgment is being made about the matter, because of the failure to have the garage ready, there are delays, downtimes and nervous strains continuing in the construction of the nuclear power station. Because of this, people are abandoning the construction project. Here are some fresh facts: diesel electric power generator machinist A. Belov, electric welder A. Mamedov and carpenter and

concrete worker A. Pobereznikov explained their departure by the desire not to lose time just getting to the work site and back. With the overall complexity of the problem, about three hours are expended on this. While the distance is 25 kilometers in all. This is a quite alarming symptom. While it is warm, one can stand on the street, get to the construction site on one's own motorcycle or in the open cab of a truck. But day by day it is getting increasingly colder and the transport situation is getting even worse. So that there is no time for postponing the start-up of the garage. The same stringent control should be established for this construction project as for the station itself.

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BRIEFS

ZEYSKAYA GES POWER LINE--Unique Crossing. The builders of the longest 500 KV power line in the Far East from Zeya to Khabarovsk have started the crash work on the Bureya River in the Taiga. This is the third large water barrier over which a custom power crossing must be erected. In order to accelerate the work, the concrete plates of the foundations and the steel structures of the supports are delivered here by helicopters. In just this year, the thousand kilometers of trunk line will deliver current from the Zeyskaya GES to Birobidzhan, Khabarovsk and Komsomol'sk-na-Amur. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Sep 82 p 1] 8225

NEW POWER LINE DESIGN--Trunk Power Lines. How do you boost the carrying capacity of electric power transmission lines? By increasing the voltage? But this increases the capital outlays for the construction of the power line, and their negative impact on the environment becomes more noticeable. For this reason, scientists of the Department of Power Engineering Cybernetics of the Moldavian SSR Academy of Sciences have chosen another path. In conjunction with their colleagues from the Moscow Power Engineering Institute, they have developed high voltage power transmission lines of a fundamentally new type, which have been given the name of "controlled autocompensating". By virtue of a substantial reduction in the characteristic impedance, the carrying capacity of such power lines is higher by a factor of 1.2 to 1.5 times, while the ecological impact is many times less. This has been confirmed by tests of the first industrial prototype lines at voltages up to 100 kilovolts. And the now the design of the new types power transmission line rated at 220 kilovolts has begun. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Oct 82 p 4] 8225

SURGUTSKAYA GRES--Power From Northern Petroleum. Surgut. The 14th power unit at the Surgutskaya GRES, a station operating on byproduct petroleum gas, went on line yesterday ahead of schedule. Its capacity is 180,000 kilowatts. In contrast to preceding sets, this set is a heat generating unit. It would generate not only electric power, but also heat. This is quite important under the conditions of the far north, for up until now, Surgut has been heated by numerous boiler plants operating on fuel oil. [Text] [Moscow GUDOK in Russian 12 Oct 82 p 1] 8225

GRES FUEL FEED MECHANIZATION--"Loader" for the GRES's. Donetsk. Continuous duty loading machines will assist in the complete mechanization of the delivery of fuel from the storage dump to the furnaces of thermal electric power stations. The production of these machines has been mastered by the Donetsk machine builders. The new equipment is intended for ultrahigh capacity electric power stations being built to use the inexpensive coals of Kazakhstan and Siberia. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 1 Oct 82 p 1] 8225

SHAMKHORSKAYA GES TURBINE INSTALLED--Installation Completed. The installation of the first 190,000 kilowatt capacity turbine has been completed in the construction of the Shamkhorskaya GES, which is being built on the Kura. The large modular block technique of installation and construction of the specialized sections has accelerated the work pace and made it possible to improve work quality. The start of the largest hydroelectric power construction project in Azerbaijan is planned for next month. The importance of its timely construction was noted by L.I. Brezhnev in a speech when receiving the Order of Lenin of the Azerbaijan SSR. The main forces of the hydroelectric project builders were concentrated on the sections of the first starting complex. The concreting of the penstock is being completed, via which the water of the Shamkhorskaya artificial sea will be fed to the turbine. The Shamkhorskaya GES with a capacity of 380,000 kilowatts is the first station of the central Kura series. The creation of the hydraulic development will assist in irrigating more than 75,000 hectares of fruitful land in the west of the republic and expand the area to be sown in cotton, grapes, grains and feedgrain crops. [By F. Dzhafarov] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Oct 82 p 2] 8225

ZUYEVSKAYA GRES--On the Report from the Second Zuyevskaya GRES (No. 33). In the newspaper article concerning the bringing of new capacities on line at the Zuyevskaya GRES-2, a justified criticism was leveled against the Taganrog "Krasnyy Kotel'shchik" Association which delivered a boiler with structural design imperfections. For this reason, there were three shutdowns of the power unit. The defect was eliminated in accordance with the recommendations of the plant and the boiler is now operating reliably. The second boiler now being installed was fabricated by the association with a changed hydraulic configuration. [By V. Gurevich, Boiler Making Administration Chief, Ministry of Power Machine Building] [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 82 p 8] 8225

NEW TRANSCAUCASUS POWER LINE--The Stavropol'skaya GRES and the Inguri GES which is located on the other side of the main Caucasus range will be joined by a 500 KV power transmission line. The installation of the supports in difficultly accessible terrain, across the glaciers of the Makharskiy pass, has been started along the route of the line. The prefabricated metal structures are delivered here, in the heights above the clouds, by helicopters. This power bridge will improve the electricity supply to the industrial centers and agricultural regions of the Transcaucasus and the south of the nation's European area. Uchkulan. (Karachayevo-Cherkesskaya autonomous oblast). [Text] [Kishinev SOVETSKAYA MOLDAVIA in Russian 11 Sep 82 p 1] 8225

SAYANO-SHUSHENSKAYA GES PERFORMANCE--Power from the Sayan. The pointer of the counter on the central control console of the Sayano-Shushenskaya GES has been approaching the 17 billion figure. This is how many kilowatt-hours of electrical power one of the largest hydroelectric power stations on the planet has generated since the day the first unit was started. Today there are six machines on line. They daily deliver about 45 million kilowatt-hours of electrical power to the unified power system. Simultaneously under construction and operating ahead of the schedule graph, the Sayano-Shushenskaya GES is constantly stepping up the pace. [by A. Shcherbakov] [Text] [Moscow IZVESTIYA in Russian 11 Oct 82 p 1] 8225

GES CONSTRUCTION PROGRESS--The fifth hydroelectric power set of the cheboksarskaya GES which is under construction has gone on line at the industrial load. The capacity of the station had now reached 390,000 kilowatts. The Cheboksarskaya GES is the fifth stage of the Volga series. The third power set of the Dnestrovskaya GES has gone on line. Its capacity is 117,000 kilowatts. The new power unit was placed in service three months ahead of schedule. The capacity of the station will reach 700,000 kilowatts with the start of yet 3 more power sets. The builders of the Kurpsayskaya GES have completed the installation of the turbine for the fourth and last power unit. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 82 p 3] 8225

ROSTOVSKAYA AES--"Sometimes We Wait, Sometimes We Hurry to Catch Up. . .". The newspaper has come out. What has been done? In the newspaper article "Sometimes We Wait, Sometimes We Hurry to Catch Up. . .", which was printed in SOTSIALISTICHESKAYA INDUSTRIYA on August 14th, 1982, the topic was disputes in the construction of the dam which is being erected for the cooling pond at the Rostovskaya AES. The secretary of the Volgodonsk CPSU City Committee, A. Tyaglivyy, has replied to this report in the newspaper. He has reported that the article was considered at a meeting of the party municipal committee bureau. The criticism contained in the newspaper article was acknowledged as correct. The party committee of the "Volgodonskenergostroy" trust was cited for inadequate attenation to the questions raised in the press. A number of management supervisors were penalized by the party. The management of the "Atomenergostroy" construction administration of the "Volgodonskenergostroy" trust was asigned the task of setting up the supervision of the implementation of the cooperative agreements concluded between the general contracting and subcontracting organizations. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Oct 82 p 2] 8225

TATARSKAYA AES CONSTRUCTION START--The biography of the future Tatarskaya nuclear electric power station on the shore of the Kama is just beginning. Here the laying of the station foundation is underway. In time, the city of Kamskiye Polyany will be built. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Aug 82 p 1] 8225

CHUVASH POWER GRID CAPACITY--Brought On Line. Cheboksary. Another small light has lit up on the enormous lighted display in the dispatcher control center of the Chuvash Power Administration. It means that the sixth hydroelectric unit of the Cheboksarskaya GES has gone on line. The overall capacity of all of the electric power stations located in the territory of the autonomous republic now exceeded one million kilowatts. All of the electrical demands of the Chuvash cities and settlements are met using the power which is generated by the stations of the automonous republic. By the end of this year, a seventh hydroelectric unit should go in service at the Cheboksarskaya GES. And at the TETs-3 [central district heating and electric power station 3], yet another high capacity power unit will start up in the young Chuvash city of Novocheboksarsk. [by Yu. Knyazev] [Text] [Moscow PRAVDA in Russian 17 Oct 82 p 3] 8225

PETROPAVLOVSK 500 KV SUBSTATION--The reliability of the power supply to the northern Kazakhstan region has been improved by the Petropavlovsk 500 kilovolt substation which has gone on line. It has made it possible to bring the Omsk to Petropavlovsk power transmission line up to the design carrying capacity. The changeover of the power transmission line to a higher voltage will assist in significantly curtailing current losses as well as in more completely meeting the demand of the economy for electricity. [Text] [Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 12 Sep 82 p 1] 8225

SHAMKHORSKAYA GES GENERATOR--Speed and Quality. Novosibirsk, 1 October. The manufacture of the second hydroelectric generator for the Shamkhorskaya GES in Azerbaijan started today at the Novosibirsk "Sibelektrotyazhmash" plant. Such is the specific assistance of the Siberian workers for the hydroelectric builders of their fraternal republic. Comrade L.I. Brezhnev spoke of the special importance of the timely construction of the Shamkhorskaya hydroelectric power station at a festive meeting in Baku. In response to this, the electrical machine builders consolidated the schedule, placing the fulfillment of the order under special control. The design of the 190,000 kilowatt capacity electrical machine was worked out taking into account the latest scientific achievements: its weight was reduced and its reliability was boosted substantially. A curtailing of the time-frames for the installation of the hydroelectric power generator at the GES is aided by the structural design of the rotor which makes it possible to install it on the foundation section by section. [Text] [Baku VYSHKA in Russian 2 Oct 82 p 1] 8225

POWER LINE INSULATOR PRODUCTION--Deliveries for the Power Bridge. The L'vov insulator plant has filled the order of the builders of the power transmission line which will link the Ekibastuz fuel and energy complex to Kokchetav. The last batch of products was shipped yesterday for this power bridge. More than half a million suspension assembled insulators have been manufactured. To increase the output of this product, the shops and glass making furnaces were rebuilt and the equipment was modernized. Products with the enterprise trademark are now being delivered to numerous power engineering facilities as well as thermal and electric power stations under construction in Siberia, Central Asia and the nation's western regions. L'vov. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Oct 82 p 1] 8225

NEW BAM POWER LINE--Power Bridge Over the Taiga. Dzhamku. Khabarovskiy kray. The brigades of builders and installation workers of the Eastern Siberia Electrical Power Network Construction Trust have started their assault on the Bureinskiy mountain range. The 220 KV power line which is being run through the mountain ridges, swamps and the Mary will link the Baykal-Amur workers of the Berezovyy and Dzhamku settlements. It will improve the power supply to the railroad stations and sidings as well as the timber industry enterprises under construction here. The almost 100 kilometer long power bridge will go on line by the 65th anniversary of the Great October Revolution. [By M. Kolbasko] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Oct 82 p 2] 8225

NEW 500 KV POWER LINE--RSFSR. Power Bridge Across the Glaciers. Uchkulan. The 11th. A 500 KV power transmission line will connect the Stavropol'skaya GRES and the Inguri GES which is located on the other side of the main Caucasus range. The installation of the supports in difficultly accessible terrain, across the glaciers of the Makhar gap, has started along the route of the line. A mechanized column of the Caucasus Electric Power Network Construction trust, all terrain tractors, bulldozers and mobile cranes, is at the disposal of the experienced installer S. Tsotsoriy heading up the work. But even such powerful equipment proved to be inadequate to break through to the Makhar. Helicopters are assisting in bringing the prefabricated metal structures up here to an altitude of about 3,000 meters above sea level. The high mountain power bridge will improve the electricity supply to the rapidly developing industrial centers and agricultural regions of the Transcaucasus and the south of the nation's European area. [Text] [Kiev PRAVDA UKRAINY in Russian 12 Sep 82 p 1] 8225

POWER LINE COMPLETED--Power Bridge Constructed. The 200 kilometer 500 kilovolt power transmission line between the Stavropol'skaya GRES and the "Tsentral'naya" substation in the Apsheronsk region of the Krasnodarsk kray went into service yesterday. This route will provide a reliable electrical power supply to the industrial centers and agricultural regions of the area near the Black Sea. The Stavropol'skaya GRES is the youngest in the Northern Caucasus. Its first power unit rated at 300,000 kilowatts went on line about seven years ago. There are now seven such units and the construction of the eighth has started. When it is placed in service at the end of the coming year, the electric power station will reach the design capacity. This will make it possible to expand the number of addresses to which electric power is delivered. Solnechnodol'sk, Stavropol'skiy kray. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Aug 82 p 1] 8225

KRASNOYARSK TETS-2--KRASNOYARSK. The third power unit of the Krasnoyarsk central heat and electric power station No. 2 went on line a month earlier than planned. Collectives of installation and construction workers of the Main Krasnoyarsk Industrial Installation Administration and the Krasnoyarsk TETs worked in a clear-cut and smooth manner on the construction of this most important facility. Competition based on the principle of "workers relay race" was organized here right from the very first days. This allowed the builders and operational workers to turn the power unit over ahead of schedule and successfully fulfill the obligations they assumed in honor of the 60th anniversary of the founding of the USSR. [By M. Malakhiyev] [Text] [Moscow STROITEL'NAYA GAZETA in Russian 15 Sep 82 p 2] 8225

SMOLENSK TETS-2 TURBINE--Penza. Turbine On Line. A new turbine set with a capacity of 110,000 kilowatts, and the third one at the station, was brought on line with the industrial load at the Smolensk central heat and electric power station No. 2. The capacity of the central heat and electric power station has now reached 280,000 KW. Its heat output has also risen substantially. Smolensk will henceforth be completely provided with a centralized heat supply. The turbine was started by the brigade of the "Zapenergostroy" trust and the subcontracting organizations a month and a half ahead of the deadline set by the standards. The quality of its installation is excellent. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Aug 82 p 2] 8225

DNESTR GES--The Electrical River Is Filling Up. Novodnestrovsk. Chernovitskaya oblast. The festive neon lights flashed for the third time over the young settlement. This is how the bringing on line of the next unit of the GES under construction on the Dnestr was saluted here. The success which was achieved confirmed the accuracy of the calculations of the hydroelectric power builders and the correctness of their corrections which were made during the course of installing the equipment. They dispensed with the assembly of all of the components directly in the crater, as was proposed earlier, but installed them in modular blocks, which were put together beforehand on the construction site. At the initiative of the leading workers of the Special Hydroelectric Power Equipment Installation Administration section and the Administration for Major Structures, the competition based on the principle of "workers relay race" was extended throughout all brigades. Khar'kov machine builders, Zaporozh'ye metallurgists and other equipment suppliers were actively included in the competition. The powerful flow of energy flooded into the nation's electrical river. Additionally, the taming of the unruly Dnestr will make it possible to protect the populated points along the shore against floods, improve their water supply and provide life-giving moisture to more than 500,000 hectares of land on the farms of the Ukraine and Moldavia. [By Ratau S. Kashtalyanchik] [Text] [Kiev RABOCHAYA GAZETA in Russian 29 Sep 82 p 2] 8225

HIGH VOLTAGE POWER CABLE--A cable for 500 kilovolt power lines recently underwent successful tests in the high voltage laboratory of the Perm' "Kamkabel'" plant. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Oct 82 p 6] 8225

KOLYMSKAYA GES EKIBASTUZSKAYA GRES--The volume of the water reservoir at the Kolymskaya GES has exceeded a billion cubic meters. The filling of the man-made sea up to the design level has been completed, which provides for the start of the second hydroelectric plant. Continuous duty loading machines will assist in the complete mechanization of the delivery of fuel from the storage dump to the furnaces of thermal electric power stations. The production of these machines has been mastered by the Donetsk machine builders. The delivery of the prototype unit from the Plant imeni Leninskiy Komsomol Ukrainy to the Ekibastuzskaya GRES-1 has been completed. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 82, p 3] 8225

CSO: 1822/37

DEVELOPMENT OF FUEL AND ENERGY BASE

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 7, 1982 (signed to press 22 Jul 82) pp 82-88

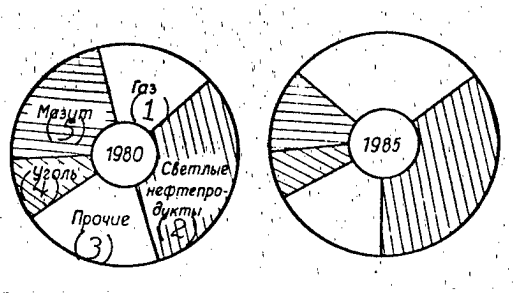
/Article by A. Yu. Grinbergs, V. A. Zebergs, and A. Ya. Lazdyn'sh: "Prospects for the Development of a Republic Fuel and Energy Base"/

/Text/ By TEK/fuel and energy base/ development should be understood the improvement of the fuel and energy economy of the country, as a whole or in its individual economic regions (republics), by the drawing in and improvement of new more effective types of fuel and energy, the invention and use of new equipment and technology, new forms and methods for the more efficient utilization of fuel and energy, new forms and methods for directing the fuel and energy economy, including the planning and management of the fuel and energy supply.

The following are the goals in developing a TEK:

--meeting the current requirement of the national economy of the republic for TER/fuel and energy resources/ required for its normal functioning and further development, as envisioned by the plans for the development of the national economy;
--creating in the area of extraction, production, transportation and consumption of TER, stocks and reserves ensuring the reliable and uninterrupted supply of TER for all the republic's consumers;
--the maximum possible savings of money and materials in developing energetics while ensuring, at the same time, the reliable and uninterrupted supply of quality fuel and energy;
--the realization of the energy-saving policy to achieve the required TER savings per unit of production and as a whole;
--the savings of manpower resources in energetics;
--observing the requirements for protecting nature and the environment.

Thus, only the introduction of highly-efficient types of KPT/boiler and furnace fuel/--natural gas and fuel oil, and in the future--atomic power (for electricity and heat), already simultaneously solves several problems: it ensures a decrease in specific fuel expenditures, a decrease in the production cost of the electric and thermal energy produced thereby lowering the production cost, it saves fuel, i.e., makes it possible to conduct an energy-saving policy, decreases environmental pollution, etc. The tendencies toward improving the TEB/fuel-energy balance/ of the republic (figure 1) are based on the prospects for developing the TEK of the country.



Key:
1. Gas
2. Light oil products
3. Others
4. Coal
5. Mazut

Figure 1. Tendency in the Development of the TEB Structure of the LaSSR, By TER Types

In view of the relatively quick process of improving the development of a TEK and changing the composition of KPT in the structure of the TEB, one of the major scientific research trends in energetics has become the improvement in managing the TEK development of the country and the economic regions.[2,3] New scientifically-based methods for predicting TER consumption and optimizing the covering of these requirements are being developed by the wide use of mathematical models and computers for both the individual economic regions and the country as a whole. However, large procedural difficulties have been connected with the selection and coordination of these methods and models for solving concrete tasks as well as with the provision of qualitative initial data calculations.

Forecasting the energy resource requirement and the possibility of obtaining the required information for this has considerable importance during the constant improvement of the methods for optimizing the TEK. There are several forecasting methods and, at the same time, the problem arises of their applicability depending on the quantity and quality of the initial data and the required accuracy of the results. Among the methods for forecasting the energy resource requirement, the greatest distribution is obtained by the normative method where the energy resouce requirement Q_t for the required calculation stage t is determined in accordance with the specific consumption Q_{tij} per unit of an enlarged economic indicator or producible output and the rendered services P_{tij}.

$$Q_t = \sum_{i=1}^{i=n} \sum_{j=1}^{j=m} q_{tij} \cdot P_{tij} + \sum_{i-1}^{i=n} Q_{oti},$$

where j = m --the index of the indicator for the type of production or services and the number of these types for industry "i" of the national economy;
n --the number of industries of the national economy,
Q_{oti} --non-standardized part of the requirement of the industries of the national economy and energy resources.

Research shows that one can obtain the most accurate results by this method during mid-term planning. The basic difficulties in using this method are connected with determining q_{tij} and P_{tij}, especially in long-term forecasting. The fluctuations of these indicators, increasing for the more distant future, and also the large relative share of the non-standardized part of energy consumption allow the acceptance of the future values of Q_t with sufficient, for practical goals, reliability only in the form of mathematical expectancy within specified warranted limits.

The possibility of using statistical methods to forecast energy consumption, specifically time series forecasting methods, conflict with the scantiness of the initial data. Additionally, this information is ambiguous because the last values more fully characterize the development tendency. Under these conditions one can establish the suitability of the various methods only experimentally by generating random samples, as far as possible, of the most adequate ones for an energy consumption time series.

In principle, forecasting TER requirements must be conducted by a multiple approach, where one method supplements and checks the other. For forecast coordination it is necessary to calculate the confidence intervals of all alternatives. If they coincide or come one on the other, then one can consider them identical. If the confidence intervals zre exceeded, then one can consider that the forecasts are not contradictory when the overlap zones exceed half the confidence interval. A forecast analysis leads to the establishment of a degree of reliability for each forecasting stage.

The solution to the problem of covering the TER requirement is the job of TEB optimization. The optimization of the republic's TEB is part of the general complex of work on optimizing the TEB of the country and a large economic region. The Latvian SSR, according to its energy condition, belongs to the regions which do not have their own fuel industry, except for a low-volume peat industry which acquires all the greater importance for the cultivation of agricultural lands and the covering of other agricultural needs. Under these conditions the optimization of a TEB on a republic scale, as a rule, results in optimizing the distribution of the TER over the territory (with fixed limited resources). In principle, it is necessary to provide feedback between the optimization of the TEB of the republic, large region, and country which is connected with carrying out the optimization of the TEB in all regions in accordance with a strictly coordinated method. In the immediate future this connection is being ensured by studying the incoming part of the republic's TEB, on a sufficiently broad scope, by the presentation of appropriate composite information on the region for use in planning the TEB of the republic, large economic region, and country as a whole. The materials used when optimizing the TEB of the republic correspond to the initial data and optimization results of the TEK subsystems, specifically the schemes for developing the gas supply, the supply of liquid and solid fuels, and also the total heat and fuel supply plan of the republic.

Further scientific research on improving TEB optimization methods must provide for the creation of more improved methods for solving specific problems in developing the energetics of the republic: gas supply systems, the supply of liquid and solid fuel, a centralized and decentralized heat supply, etc. The

optimized models must provide a calculation of the highly complex external and internal relationships for developing individual energy sectors (projects) both for energy and for the whole of the national economy, and also a solution to these problems when incomplete (ambiguous) data is used. In the research on organizing the energetics of the individual republics and economic regions, special attention must be paid to solving the problems of developing a common energy base in a territorial hierarchy which, at the present time, is provided basically in the industrial cross-section of TER production (for electric power and gas supply systems, and also systems for refining and transporting oil products). The tasks, appropriate criteria, and initial data must be strictly determined when improving the models for solving regional problems in developing energy supply systems.

Research shows[1] that block TEB optimization models create the possibility to coordinate questions on developing a base in an industry cross-section and are intended for the optimization of the TEB on a republic scale. Models for optimizing the TEB with the help of energy characteristics[4] permit the solution of optimization questions in the territorial hierarchy and are used to resolve the TEB optimization problems of an enlarged economic region. The conduct of further research and the coordination of the development of these methods for TEB optimization of individual republics and large economic regions by the provision of internal and external relationships for solving the appropriate problems of managing TEK development are necessary. In the process of developing methods to optimize the TEB, as was stated above, it is necessary to consider, with significant uncertainty, the planned and specially forecasted requirement, as well as the TER. The deviation of the zone of uncertainty in the requirement and in the resources of the TER is increased when calculating for the more distant future during the optimization of the TEB both of the republic and also of the enlarged economic region. This increase is unavoidable and it is necessary to consider this when resolving problems on the development of the TEK in a regional cross-section. However, compensation for the TEB vagueness by creating appropriate reserves will provide a heightened maneuverability to the entire fuel supply and fuel utilization system and, at the same time, the possibility of realizing the optimum TEB's for specific conditions.

The calculations conducted to optimize the republic TEB and the KPT structure in it permit a determination of the basic trends in the development of the TEK and the most effective ways to achieve the goals of its development. It is necessary, at the same time, to consider the available presence of thermal energy installations and their condition, and also the fact that the reorganization of the heat and fuel supply is a lengthy and sufficiently sluggish process. The switch of boilers, especially low-power ones, during their automation, from coal to natural gas or fuel oil permits a decrease in the specific expenditure of KPT and also an increase in the power of the boilers while saving manpower resources on their maintenance and lowering the level of harmful emissions into the environment. The introduction of highly efficient TER into the technological processes makes it possible to increase equipment productivity and output quality and, in some cases, to also create new output (furnace steel, etc.).

The republic has already had some specific achievements in improving the structure of the TEB by types of KPT: a systematic increase in the relative share of natural gas, mazut and TPB/domestic furnace fuel/. The availability of a large relative share of low-power boilers even in industry (see table) with the preferred use of coal is nevertheless characteristic of the energetics of the Latvian SSR. Their switch from coal to highly-efficient KPT could yield a sufficiently-felt decrease in the specific expenditure of KPT for the production of thermal energy, although great difficulties are connected with this.

Table 1. Existing Structure of Thermal Energy Production, in Percentages

Heating and Power Plants	Regional Boilers	Heating Boilers	Industrial Power Plants	Industrial Boilers	
				Total	Small Ones Among Them
18	12	6	9	55	38

Additionally, the still relatively large amount of coal in the republic is used for lime kilning and in other industrial furnaces where the use of highly efficient KPT can significantly lower fuel expenditure. In the future (at the end of the century) the tendency to decrease coal usage to a minimum, especially in low-power boilers, can be realized mainly through the utilization of natural gas. The delivery to the republic of an additional amount of natural gas instead of coal evidently will not create difficulties either for the carrying capacity of the gas-supply system of gas mains of the Northwest USSR, or for the resources. The main difficulties here will be connected with the development of distributing gas mains and the switch of boilers to gas and fuel oil including the redistribution of KPT between consumers (the transfer of released TPB during the gasification of some boilers operating on coal to other boilers located outside the gasification zone). The switch of low-power boilers to highly-efficient types of fuel (natural gas and TPB) allows, as noted above, a savings of manpower resources to maintain the thermal energy installations (during the automation of their operation), which is very important for the republic. The specific outlays of capital to maintain such boilers which operate on coal are very great and the savings with their transfer to TPB and automation amount to 30-40 rubles a year per ton of conventional fuel which covers all costs for carrying out this work. The advisability of switching boilers to natural gas will determine the costs for the distributive transportation of gas. However, on the strength of the necessity to save fuel oil (TPB) in light of a manpower shortage, a significant broadening of the zone covered by gasification of both the cities and the rural areas will be advisable. Taking into account the fact that, in practice, the number of personnel maintaining heating boilers is one to two people for small boilers and up to nine people for boilers with a capacity of 2-3 gigacalories per hour (there are several thousand such boilers in the republic), the toal possible manpower savings can be estimated on the order of ten million workers. To automate these boilers we require capital investments on the order of 15-20 million rubles which, however, by using the released workers in industry sectors with high productivity, can pay for itself in one year (without calculating savings of TER, etc. obtained in this case).

An increase in the capacity of thermal power installations during their transfer to natural gas or fuel oil yields a definite savings of capital investments connected with the extension of the widening of boilers there where it is required in accordance with the conditions for the development of the heat-supply system fed from this boiler.

The growth in fuel oil consumption, as KPT, must be restrained in the future. Mazut consumption must decrease in the republic to the 1975 level by the end of the current five-year plan. A further decrease in mazut consumption, due to natural gas, is advisable. Under the conditions of the decision directed by the 26th CPSU Congress on the orientation in the development of atomic energy in the European part of the country and the actual cessation of construction in the Northwest USSR of condensation power stations based on organic fuel, which clearly resolves the development of the electroenergetics of the republic as a constituent part of the Northwest USSR unified energy system, objective prerequisites are created for the development in these regions also of a heat supply based on atomic sources and the broad construction of AST's /atomic heating stations/ or ATETs/atomic heating and power plant/ for the heat supply of cities and industrial centers. Therefore, to further decrease organic fuel consumption, we ought to examine the advisability of constructing AST's for the Riga zone. Besides the displacement of organic fuel as the main source of the heat supply (TETs/heat and electric power stations/ can be used as peak sources of heat in the cold winter periods), an AST in the Riga zone will permit, in these conditions, the liquidation of numerous industrial boilers, simultaneously improving the air basin of the city and solving the problem of the additional release of manpower resources (see figure 2). This suggests new requirements for the development of thermal networks and the gradual creation of heat supply systems with a sufficient level of automation for them. In the future an increase in the number of heating customers in Riga by an independent connection circuit with front regulators, will create the conditions for changing heating plant network operating schedules by the connection to them of industrial customers and by ensuring the coverage of the overwhelming part of even the technological requirements for heat.

The inadequate growth rate in the near future of centralized heat and of the switch of available housing with furnace heating to centralized heating will preserve a comparatively high consumption of furnace fuel for a lengthy period of time. At the same time a relatively quick reduction by the timber industry of firewood pieces (lumber, including forest waste materials, will be used even more in the woddworking industry and construction) in the future can create difficulties in supplying the population with furnace fuel. It should be kept in mind that the peat industry, as noted above, is assuming ever greater importance in the cultivation of agricultural land resources, in the production of bedding material for cattle, and in covering other needs of agriculture. Therefore, the output volume of peat briquettes will not increase. Although the requirement for furnace fuel in the more or less distant future will gradually decrease in view of the development of central heat in the cities and the construction of rural settlements with buildings with central heat, this will entail the displacement, first of all, of the fuel procured on local initiative by the population and it is obvious that it will nevertheless be necessary, under these conditions, to maintain the peat briquette production volume on the 1980 level until the end of the century.

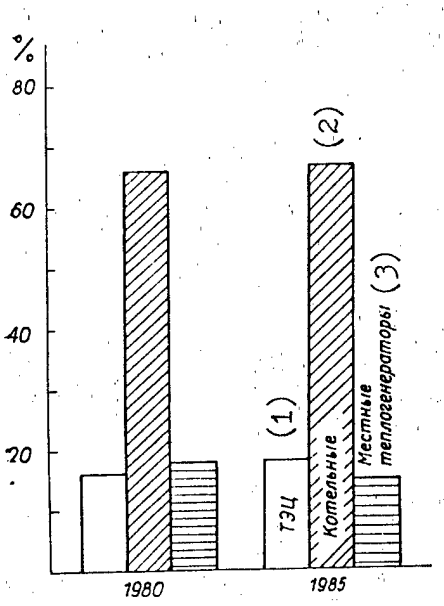


Figure 2. Development of the Structure of LaSSR Thermal Energy Sources

Key:
1. Heat and electric power stations
2. Boilers
3. Local thermal generators

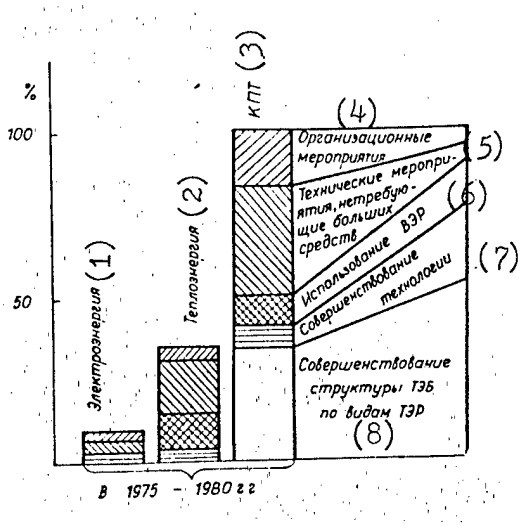


Figure 3. Tendency in Changing the Structure of Measures to Realize the Energy-Saving Policy in LaSSR Industry

Key:
1. Electric energy
2. Thermal energy
3. KPT
4. Organizational measures
5. Technical measures not requiring large capital
6. Use of VER
7. Improvement of technology
8. Improvement of TEB structure by type of TER

All of the large requirements are moving toward a savings of TER which must be taken into account when forecasting their requirements, optimizing the TEB, and solving the problems of developing the TEK of the republic. TER savings at the present time are realized mainly because of the improvement in the structure of the TEB by type of KPT, technical measures not requiring large expenditures, and also organizational measures whose resources in the near future (5-10 years) basically will not be exhausted. The introduction of temperature control devices into the central heat systems, which do not require large expenditures, can yield a TER savings of 20-30 percent. The automation of low-capacity boilers, operating on liquid fuel and gas, which will permit one to fully obtain that impact (an increase of KPT) which must improve the TEB structure by type of KPT, belongs to that category of measures which must be realized urgently. The use of VER[secondary energy resources] and the introduction of energy-conserving technology[5] which, in the near future, is limited both by capital investments and by the capacity of the machine building industry (see figure 3) must assume even more importance in the future. However, in view of the importance of creating energy-conserving technology and using VER, scientific research, the cooperation of the machine building industry, and appropriate capital are required.

Conclusions

In the future (by the end of the century) the development of the TEK of the republic, in compliance with the development of the TEK of the country, which can fully provide growth in the national economy of the republic, an increase in the well-being of the population, and the influence of the energy and fuel supply conditions on the distribution of the productive forces of the republic, will be insignificant. The republic's electric power system is so developed that it can provide all industries of the national economy of the republic, as well as the cities and agricultural localities, with a dependable energy supply. However, besides the measures for the general increase in the quality and reliability of the electric supply, a planned increase in the carrying capacity of the appropriate elements of the electrical network is also required for this. In accordance with the requirements to develop the national economy at a faster pace, a basic heat supply industry and the transportation of fuel oil and solid fuel must be developed. The main problems connected with this will be the development of a gas supply system requiring significant monetary, material, and manpower resources. This definitely also concerns the development of central heat. At the same time a central heat supply system is the basis for the creation of a future heating system for all of the Riga zone with the possible introduction, in the more or less distant future, of an atomic heat supply source. The local fuel industry (peat and lumber) assigns an ever smaller part to the production of fuel. Peat acquires all the greater importance in the cultivation of agricultural land resources and in covering other agricultural needs, and lumber, including lumber waste products--in the woodworking industry, owing to the fact that by the end of the century a significant reduction in the planned shipments of firewood and the complete disappearance of fuel procured on local initiative by the population is expected. Therefore, the rate for converting available housing to a central heat supply and central heating must exceed the rate for decreasing the use of furnace fuel. The future development of the TEB structure of the republic, by fuel type, in view of the small relative share of the TER requirement in the republic on a country scale in the future is, to a large extent, undetermined and can be brought out only as variables, especially in regard to oil products (as KPT) and natural gas. This suggests a special requirement for scientific research to improve the methods for forecasting and optimizing the TEB, and also for solving the other problems on developing the TEK of economic regions (republics) in circumstances where there is insufficiently definite information.

FOOTNOTES

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8524
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BASIC DIRECTIONS OF UKRAINIAN CENTRALIZED HEAT SUPPLY DEVELOPMENT

Kiev ENERGETIKA I ELEKTROFIKATSIYA in Russian No 3, Jul-Sep 82 pp 3-8

[Article by V. F. Sklyarov, UkSSR minister of power and electrification]

[Text] At present more than a third of all fuel used, i.e., more than for the production of electrical power in the national economy of the republic, is spent for the production of heat.

In 1980 the use of heat in the national economy of the UkSSR reached 400 million gigacalories including in industry -- 270 million gigacalories, in the housing and municipal services sector -- 135 million gigacalories, i.e., 65 and 35% respectively.

Since the development of the national economy of the republic is based on the very rich raw material reserves necessary for all basic industrial sectors and favorable natural conditions for agriculture, and calls for a constant increase in requirements in heat energy, the efficient utilization of fuel-power resources of the UkSSR acquires special national economic importance.

A centralized heat supply should be considered the most efficient direction of fuel utilization.

For this purpose, traditional measures are being carried out systematically in the republic. These measures include building central heating and power plants and powerful industrial and heating boiler plants.

Favorable conditions for a centralized heat supply on the basis of TETs and large boiler plants are being created as a result of building industrial enterprises in special zones and housing -- in the form of large blocks.

The selection of the type and capacity of centralized heating sources and the efficient development of heating networks present a complex multifactor power-economic problem on whose correct solution depends the national economic effect of the power supply system as a whole. Proceeding from this, over 20 years ago special subdivisions, occupied with problems of long-range development of heat supply systems, were created in the system of planning organizations of the USSR Minenergo [Ministry of Power and Electrification].

In special papers on the prospects for the next 10 to 15 years, the levels of heat consumption are evaluated, optimal ways to develop heat supply systems are determined, and requirements in capital investments, labor and material resources for the realization of the recommendations are identified.

These papers are of a regional nature (technical-economic reports and other data on the development of the heat supply in the UkSSR), as well as local (arrangements for heat supplies in cities and industrial centers) and technical-economic substantiations for building individual heat supply sources.

According to decrees of the USSR Gosplan, the USSR Gosstroy [All-Union State Construction Office] and the UkSSR Council of Ministers, arrangements for the central heating of cities with populations of more than 100,000 are developed by planning organizations of Minenergo, while for other cities -- by organizations of the UkSSR Minzhilkomkhoz [Ministry of Housing and Municipal Services].

As a result of the realization of the proposals of heat supply arrangements, centralized heating systems were created which were based on TETs and large regional boiler plants for the large cities of the republic which are being operated successfully at the present time.

As is well known, TETs are the most efficient source of heat supply that, due to their combination output of heat and electrical power, have a low unit consumption of fuel for producing electrical power (unit fuel consumption for producing heat at TETs is the same as at the most efficient boiler plants).

A centralized heat supply by the Ministry of Power and Electrification consists basically of the combined heat and electrical power supply.

The history of Soviet combined heat and electrical power supply is integrally tied to the development of domestic power engineering.

In the Ukraine, before the revolution, there was no combined heat and electrical power supply in the modern sense. Some enterprises had heat-power installations in which spent steam was used to supply heat only to their own consumers or even to individual buildings (the opera house in Kiev).

The present TETs appeared only in the thirties when a TETs was built in Kiev at the RR terminal, and in Khar'kov -- the Tractor Plant TETs and the TETs-3 that provided central heating not only to enterprises, but also to housing blocks of adjacent rayons.

In the forties, a number of industrial heat and power plants were built and expanded: the Khar'kov TETs-3 and TETs-4, the Nikolayevskaya and Makeyevskaya TETs, the "Zaporozhstal'" TETs and others.

The building of TETs continued after the war.

During the 5th Five-Year Plan period, TETs made up 24% of the total capacity of steam-turbine installations in the republic.

In 1955, heat output of TETs was 19 million gigacalories of which over 21% was produced by rayon electric power plants of the Minenergo.

In the following 10 years the heat output of TETs more than tripled. During this period the Chernigovskaya and Kremenchugskaya TETs were placed in operation using equipment with steam parameters of 130 kg/cm^2 and 565°C.

At the start of 1971, at the TETs of the UkSSR Minenergo alone, over 100 heat and power machines were installed with a total electrical power of 2.3 million kilowatts and a thermal capacity of 87,000 megawatts (7500 gigacalories/hour). In 1970, the heat output of the UkSSR Minenergo electric power plants was about 32 million gigacalories.

During this period, a number of thermal electric power plants (Kiev GRES-2, Krivoy Rog GRES-1, Dneprodzerzinsk GRES) were partially or fully changed over to the heat-electric power supply mode. Along with raising the operating indicators of the electric power plants, this also improved the heat supply conditions to the adjacent rayons.

In the 9th Five-Year Plan period, the UkSSR Minenergo did a great amount of work to develop further the heat and power supply of the republic. Thus, during the 9th and 10th Five-Year Plan periods, the UkSSR Minenergo spent 180 million rubles in the electrical power sector to build heat supply facilities at Kiev alone. During this period, there were installed in the capital of the republic four turbines with a total capacity of 700 megawatts at the TETs-5; the first unit was started up at TETs-6; water-heating boilers were placed in operation with a heat productivity of 975 megawatts (840 gigacalories/hour), and almost 60 kilometers of heat network mains were built.

The Kiev TETs operate the most powerful heat and electric power units in the republic with 250 megawatt turbines.

At present, over 250 TETs operate in the republic with an installed capacity of 6.4 million kilowatts of which 28 TETs with a capacity of 3.5 million kilowatts belong to the UkSSR Minenergo. All TETs of the republic provide 30% of its heating requirements not including agriculture. Due to the production of electric power at the TETs, not less than three million tons of conventional fuel are saved annually.

A greater part of TETs equipment (especially small ones, belonging to industrial enterprises) is on the edge of being physically worn-out, while the construction of new TETs is being sharply reduced due to the limited resources of organic fuel in the European part of the USSR. The necessity of economizing on scarce types of fuel determined the beginning of the process of modernizing small TETs into rayon boiler plants with the stopping of production of electric power. This direction will be implemented as the electric generating equipment wears out.

Rayon boiler plants, equipped with water-heating and high productivity steam boilers are considered next to TETs in effectiveness. These boilers have a low unit fuel consumption of 172 to 178 kilograms of conventional fuel/gigacalorie and a low personnel coefficent.

The ratio of such boiler plants in providing heat requirements to industry and the housing-municipal service sector of cities is 17% (housing-municipal service sector -- 21%). These boiler plants, as compared to decentralized heat sources, save not less than 3.5 million tons of conventional fuel today.

Large rayon boiler plants are comparatively easily built for housing blocks, but are extremely difficult for groups of industrial enterprises where their construction is tied to obtaining shares of money from enterprises of various departments with different construction schedules.

This problem requires an immediate solution.

In the very near future, the role of large boiler plants in the heat supply balance of the republic must increase by not less than 1.5 times with an annual heat output of 125 million gigacalories which, as compared to decentralized heat sources, will provide an annual economy of not less than 6 million tons of conventional fuel.

Where centralized heat is not developed properly, small heat supply sources are in operation whose share in meeting heat requirements of the republic is, regrettably, some 35% for the industry and housing-municipal services sector alone. They produce about 140 million gigacalories per year.

At present, in the cities of the republic, 35,000 small boiler plants are in operation whose average productivity is not greater than one megawatt (one gigacalorie/hour). About half the fuel they burn is coal which, simultaneously with low heat productivity, leads to greater personnel requirements of 4 to 5 persons/megawatt (4 to 5 persons/gigacalorie/hour), or 30 to 50 times greater than at large fuel oil boiler plants. Small boiler plants overconsume about four million tons of conventional fuel annually because their unit fuel consumption is 1.5 times higher than that of the big ones.

Elimination of only half the small boiler plants in large cities would make it possible to save about 1.5 million tons of conventional fuel annually and reduce the number of operating personnel by not less than 30,000 persons.

Heat supply sources in the republic consume considerable fuel and must develop in organic correlation with the formation of the fuel-power balance which is of a regional nature. If it is taken into account that in the very near future organic fuel requirements for supplying heat must increase by not less than 20%, and that it may be necessary to haul Kuznetsk coal in over long distances, the necessity becomes obvious of using new types of power sources, primarily nuclear power for heat supply purposes.

In the light of the decrees of the 26th party congress on the development, in the 11th Five-Year Plan period, of nuclear power for heat supplies, many special investigations and plans were dedicated to the indicated problems.

Many years of experience in operating nuclear electric power plants and the Bilibinskaya nuclear TETs confirmed the reliability of the given type of power installations and their suitability for a heat supply.

The work done indicated that for a loading of 1000 to 1500 gigacalories/hour, the most preferred is a heat supply from ATETs [Nuclear TETs] which are more efficient than other types of energy sources.

The construction of the first large 2 million kilowatt ATETs began at Odessa and will make it possible to reduce the annual gas-fuel oil consumption by more than two million tons of conventional fuel; close up 500 small low-efficiency boiler plants that pollute the air of the resort city and will free 2500 service personnel.

Technical economic calculations confirm the efficiency of using ATETs with similar equipment for all large cities of the republic.

At present, construction has begun in the country of nuclear plants to supply heat -- nuclear boiler plants using a reactor with a heat capacity of 500 megawatts (430 gigacalories/hour). Although such installations are less efficient than ATETs, but due to the possibility of placing them directly near the consumer, considerably smaller capital investments are required to build heat networks. The indicated types of nuclear heat sources are the most preferable for meeting hot water requirements.

Taking into account the considerable level of steam consumption by industry, work is being done to create nuclear installations that make it possible to produce steam and hot water.

There is reason to assume that this problem will also be solved successfully.

Thus, the use of nuclear power sources to supply heat will make it possible to meet the growing heat needs of the republic and, at the same time, reduce organic fuel requirements, i.e., solve one of the most important national economic problems at the modern stage of economic development.

Centralized heating demands the creation of a branched system of heat networks hundreds of kilometers long in the large cities. Thus, in Kiev alone there are about 1500 kilometers of mains and heat distribution networks in operation.

At the same time, heat networks are the most vulnerable component of the heat supply network, sources of breakdowns, causes of the lack of sufficient heat and failure to provide comfortable conditions for the people.

Considering that the further development of centralized heating and the appearance of such large sources as ATETs will increase the length of heat networks still more in individual cities and industrial centers, and that their breakdowns may have still greater consequences, it has become acutely necessary to raise the operational reliability of heat networks.

The problem became of the highest priority in developing and introducing automated control systems for heat networks because the existing monitoring and control system is normally not capable of fulfilling its function, especially in breakdown situations.

It is necessary to review the specifications for the procurement of pipe and cut-off hardware. The pipes must pass an anticorrosion process at the manufacturing plant and not by a primitive process at the installation site. It is necessary to improve the design of compensating devices.

The thermal insulation designs must be reviewed and the problem of industrial methods for insulating heat network pipes must be solved. At present, insulation being wet even for a shart time becomes worthless.

Existing organization-technical methods for repairing heat networks must be reviewed.

It is also necessary to improve heat networks with monitoring, regulating and metering devices.

The fastest achievement of the indicated measures will make it possible to raise the operating standards of heat networks to meet the demands of the present.

On the day's agenda, the increased scales of heat consumption by industry and cities are especially acute problems in the wide utilization of reserves to reduce heat requirements by taking a number of energy saving measures that were determined by the decrees of the USSR Council of Ministers.

The basic directions in reducing heat expenditures must be measures taken by the consumers, while the amount of saving will depend on the introduction of new energy saving technologies and a reduction in the cost of transporting heat.

At present, the use of secondary energy resources in the republic is 30%, and the available saving reserves may be estimated at seven million tons of conventional fuel per year.

Calculations of specialized organizations indicate that for eight industrial sectors alone (ferrous and nonferrous metallurgy, chemical, petrochemical, machine building and metal-working, lumber, cellulose-paper, wood-working, building materials, food) reserves for saving heat by eliminating losses are about four million gigacalories per year, equivalent to saving 0.7 to 0.8 million tons of conventional fuel.

It is possible to reduce fuel losses in the housing-municipal services sector in existing buildings by better insulation, regulating heat distribution and taking other measures,by not less than 1%, or about 1.5 million gigacalories annually, equivalent to saving 0.3 million tons of conventional fuel.

In future housing, losses may be reduced considerably because energy saving measures may be incorporated in design and construction. According to a careful estimate by specialists, heat requirements will be reduced by 5 to 10%, equivalent to an annual saving of 0.3 to 0.5 million tons of conventional fuel.

Thinning daily electric consumption schedules with power systems containing large nuclear and thermal electric power plants that have limited maneuvering capabilities, requires a search for consumers who would regulate the consumption of electric

power. In this connection, apparently, it is necessary to review the established attitude toward electrical heating. Numerous calculations confirmed the wastefulness of electrical heating devices that operate on a loose schedule and are involved in maximum electrical loads even with the increasing role of AES in electrical supply. However, the creation of electric heating installations with heat storage makes it possible to use them in the off-peak electric load hours or at night, to equalize the electric load schedule. Calculations show that the use of such installations whose manufacture is partially assimilated by domestic industry, may be found to be useful to consumers that do not have centralized heating, especially in recreation zones where there are special requirements for the comfort and purity of the environment, and in agriculture. In the very near future, it will be necessary to organize broad investigations to identify technical and economic indicators to evaluate the effective use of the given type of installations.

At present, a huge amount of low level heat is constantly being discharged into the air and water basins by electric power plants, industrial installations and various kinds of municipal installations, the utilization of which has been given insufficient attention up to the present.

Now, possible ways to utilize it were determined and economically substantiated which will also provide considerable fuel saving.

Therefore, it is necessary to introduce heat-pumping installations widely which would make it possible to utilize the low-level heat of industrial wastes being lost at present. Such installations, utilizing storing devices, operating on a given electrical schedule could be very economical.

The strain on the fuel-power balance of the republic demands a more attentive attitude toward utilizing renewable energy resources for heat supply purposes.

A certain amount of experience was accumulated in the republic in operating solar energy installations, used to produce heat for sanitary-technical needs. Installations of this type make it possible to reduce the need for organic fuel considerably; however, their wide introduction lags. It would be very timely to accelerate work on the industrial utilization of solar energy to supply heat.

According to the opinions of specialists, the Carpathian Mountains in the Ukraine have considerable reserves of geothermal waters suitable for industrial consumption. Such waters were also found in the southern regions of the republic.

Considering the expediency of utilizing the heat of these energy sources on the site, it would be necessary to consider the question of creating agrarian complexes, primarily vegetable hothouses using geothermal waters. This would accelerate, to a certain extent meeting the food supply program of the country.

In connection with the very rapid development of industry and transport, the environmental protection problem, especially in large cities, becomes very acute.

A centralized heat system, as compared to the decentralized heat system provided by small boiler plants has a number of essential advantages:

elimination of the generation of carbon oxides, technologically unavoidable in burning solid fuels and, due to a number of complexities, in controlling the combustion process of gas and liquid fuel at small installations;

the possibility of equally efficient heat utilization of any type of fuel, which is impossible when the boiler capacity is small;

the use of the most modern technologies to suppress and utilize gaseous, liquid and solid wastes produced by burning fuel and processing water, which is practically impossible to achieve in small boiler plants.

Calculations show that even TETs, in which fuel consumption is 1.5 times higher due to producing electrical power than in boiler plants of the same heat productivity, reduce the concentration of sulfur oxides in the air to 0.5 to 0.1 and less.

If it is taken into account that 25% of the harmful air exhausts of all stationary installations in the USSR are due to thermal electric power plants, it becomes obvious that the use of nuclear energy for the heat supply solves a very important ecological problem.

The realization of the decrees by the party and the government will make it possible to reduce the requirements of the republic in scarce types of fuel by many millions of tons. Saving fuel-energy resources is entirely realistic, but demands earnest organizational-technical measures in scientific investigations, planning, construction and operation of heat consumption and heat supply systems.

According to the USSR Gosplan data, each percent of saving fuel-energy resources in social production doubles the economic effect and, in some sectors, is 3 to 4 times greater than savings from increased labor productivity. Saving fuel and energy is one of the decisive conditions for moving our society along the path toward raising the living and cultural standards of the people.

Thus, providing for increased heat requirements of the UkSSR national economy with the existing fuel-energy balance demands maximum utilization of the available resources, saving energy, the development of centralized heat supply systems on the basis of large energy sources, using organic and nuclear fuel, an increase in the reliability and efficiency of heat supply systems and the broad introduction of renewable energy resources.

2291
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PROBLEMS OF HEAT SUPPLY FOR HOUSING, MUNICIPAL SERVICES SECTOR OUTLINED

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3, Jul-Sep 82 pp 8-10

[Article by V. D. Ploshchenko, UKRAINE SSR minister of Housing and Municipal Services]

[Text] The decrees of the 26th party congress devote great attention to raising the standard of living of the Soviet people. The housing-municipal service sector and, in particular, heat supply organizations that must increase the reliability, continuity and economic effectiveness of the heat and hot water supply to workers play a great role in implementing this plan.

As is well known, heating plants are component parts of the fuel-energy complex which develops in a complicated dynamic interrelationship between the production and consumption of energy, according to climatic, demographic and other conditions in cities and populated points in the republic.

Housing-municipal service facilities of the republic consume about 35% of the total heat of the republic. A considerable part of the heat energy required by the indicated group of consumers (about 20%) is produced and sold by heat enterprises of the UkSSR Minzhilkomkhoz [Ministry of Housing and Municipal Services]. During 1985-1990, the ratio of heat production by municipal enterprises will change little.

An indispensable condition for the production of this amount of heat is a clear-cut organizational regulation of the heat producing facilities of the ministry and centralization of control.

For this reason, in 1976, the heat production facilities were separated into an independent subsector,and technical management functions were entrusted to the Heat Production Facilities Administration.

At present, the heat supply system is a large subsector of the housing-municipal service economy. It provides heat and hot water to an area of 112.3 million square meters of housing and municipal buildings, including an area of 73.5 million square meters of apartments in 293 cities in the republic.

The heat supply organizations of the UkSSR Minzhilkomkhoz have in their care 3177 boiler plants of which 2413 are automated and 724 are dispatcher controlled; the installed capacity of the boiler plants on 1 January 1982 was 19,500 gigacalories/hour with heating networks (double pipe) 8500 kilometers long.

In 1981, the production of heat energy by the heat supplying organization was 27.6 million gigacalories or 1.8 times more than in 1975, with 35 million gigacalories (based on purchased heat) distributed to consumers. This is about half the centralized heat distribution in the republic and is twice as much as was distributed in 1975.

The system is developing not only in the quantitative, but also in the qualitative respect.

Here a characteristic indicator is the increase of the unit installed capacity of the boiler plants. Thus, for the heat economy as a whole, in 1981 the unit installed capacity was 6.2 gigacalories/hour as compared to 5.6 gigacalories/hour in 1980. Some 14 boiler plants have an installed capacity of 100 and more gigacalories/hour. The number of hours of utilization of the installed capacity at these boiler plants is near 1900 for an average indicator for the republic of 1450.

The unit conventional fuel consumption was reduced from 177 kg/gigacalorie in 1978 to 175.8 kg/gigacalorie in 1981.

Along with increasing heat capacities, considerable work was done to eliminate small inefficient boiler plants. During the 10th Five-Year Plan period, 914 such boiler plants were eliminated as against 555 per plan which freed conditionally 2500 service personnel and saved over 200,000 tons of conditional fuel and about 40 million kilowatt-hours of electric power. In 1982, 162 inefficient boiler plants were closed as against 110 per plan which also made it possible to obtain a considerable economic effect.

The achievements of science and technology are being constantly introduced in the subsector. Many of them are the results of the activity of our industrial scientific research and planning institutes.

Among these works the following should be noted: investigations and development of materials for designing anticorrosion protection for the UkSSR heat supply systems for various water groups; creation of the "Plamya" standardized automatic control system for water-heating boilers operating on liquid and gaseous fuel; the creation of the IRT-30 heat consumption meters; the creation of the PKUZh-1 mobile boiler installation for emergency heating on the basis of supercharged boilers using liquid fuel; creation of MGV-PG-1 automatic, compact water heater for heating and hot water supply and, on its basis -- a "roof" boiler plant.

At present, an ASU [Automatic Control System] TP [expansion unknown] for supplying heat in Khar'kov and Rovno is being developed and introduced.

In the 10th Five-Year Plan period, the economic effect as a whole from introducing measures on new equipment in heat supplying organizations was 4 million rubles.

To implement the decrees of the 26th party congress, work was done consistently in the heat supplying industry to save fuel-energy resources.

A system of norms for heat, fuel and electric power consumption is being developed for this purpose. Thus, instructions were prepared for calculating and setting

norms for unit consumptions of electric power for producing and transporting heat energy by boiler plants. Its introduction saved over 200,000 rubles in 1981. New norms and instructions were developed to set norms for fuel and heat energy consumption for heating apartments and municipal buildings, for household needs, as well as for heating apartments and municipal buildings that do not have centralized heating etc.

Great attention is being devoted to the further development of the heat industry. Long-range developments were incorporated in arrangements to supply heat to cities in which economic expediency and the necessity of planning and constructing new boiler plants and expanding and modernizing existing ones and heat networks are substantiated. Arrangements for cities with populations of over 100,000 are being developed by the USSR Minenergo [Ministry of Power and Electrification], while for cities with populations of less than 100,000 -- by the UkSSR Minzhilkomkhoz (the "Ukr NIIinzhproyekt"). Some 37 arrangements were prepared since 1979. Heat supply arrangements are being developed for 146 cities whose rated heat loads are greater than 50 gigacalories/hour; for remaining cities with rated loads of less than 50 gigacalories/hour -- planning considerations are being developed on the centralized heating of the city.

Planning solutions adopted in the heat supply arrangements are being incorporated in seven cities. Technical-working designs for rayon and block boiler plants are being completed, and several heat sources are already being built. At the same time, 184 inefficient boiler plants of the existing 300 plants are being closed, freeing 850 service personnel, saving 1,115,000 rubles in wages; fuel saving amounts to 9500 tons of conventional fuel annually. The unit fuel consumption per a gigacalorie/hour was reduced by 18 to 20% on the average.

Capital investments in the recommended centralized heat supply sources for these seven cities are about 5.6 million rubles.

Later on, 206 arrangements for heat supply to cities of the Ukraine will be prepared which will make it possible, on the basis of calculation data after the introduction of these arrangements, to save about 300,000 tons of conventional fuel, close about 6000 small inefficient boiler plants, free conditionally about 14,000 service personnel and save not less than 32 million rubles in wages.

Capital investments in building centralized heat sources and heat networks for these cities will be 481 million rubles.

The approved heat supply arrangements for the cities will make it possible for the heat supplying organizations to provide higher quality, from the economic standpoint, technical conditions for supplying heat to one or another building, and determine more precisely its participation in building the centralized source of heat supply and heat networks. At present, many heat supplying organizations, not having available arrangements for supplying heat to cities, issue specifications for building local heat sources equipped with low productivity boilers while, when the arrangements for a heat supply to cities is introduced by 1990, the low efficiency boiler plants will be closed.

In our opinion, city Soviets of people's deputies must take upon themselves the duty of realizing these arrangements.

It is necessary to dwell on the difficulties experienced by the subsector.

According to the government's decree, boiler plants previously operated by other departments, many of which are considerably lower in technical standards than boiler systems of the ministry, are being transferred to heat supply organization. Regrettably, it is not always possible to close them immediately, while continued operation of these plants leads to the deterioration of the technical-economic indicators for the system as a whole. Thus, there is observed a higher production cost of a heat unit: in 1977 it was 5.74 rubles/gigacalorie, while in 1981 it increased to 6.22 rubles/gigacalorie.

This, in its turn, reduces profit as well as the coefficient of absolute effectiveness of capital investments. In 1981, this coefficient for the majority of oblast heat supply organizations is considerably lower than the norm. Along with the above-indicated reason, it is necessary to point out that in a number of cases capital investments become unjustified. This happens when local deviations are allowed from the arrangements for developing heat supplies (for example, in Khar'kov, Vinnitsa, Odessa), expressed in building small, inefficient boiler plants etc.

However, the work done by the UkSSR Minzhilkomkhoz cannot fully solve the problem with these heat sources of which there are about 30,000 since they belong to over 50 departments which, having available their own money for construction, build boiler plants and heat networks, frequently guided by local principles.

In our opinion, the time has come to solve this problem in a centralized manner, concentrating all heating boiler plants in the hands of one master with full authority to build and operate the heat supply system.

This is especially true since the republic has the operating experience of the "Ukrgaz" Republic Association which has already been operating stably and reliably for several years, successfully solves problems of providing gas to housing-municipal and industrial facilities,and has a single technical policy in the gas economy of the republic.

These are the general outlines of the problems of the heat supply for the housing-municipal services sector. They are complex and diverse. However, there is no doubt that we will do everything necessary for their successful solution.

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NON-NUCLEAR POWER

REGIONAL MEETINGS ON RAISING POWER OUTPUT

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3, Jul-Sep 82 pp 49-56

[Text] On 14 May 1982, a meeting was held at the Slavyanskaya GRES on the subject, "Basic ways to raise the reliability and operating efficiency of electrical networks and reduce electrical power losses in the light of the resolutions of the meeting of the active members of the party and electrical industry workers held on 15 April 1982."

Representatives of the UkSSR Gosplan, the UkSSR Academy of Sciences, the UkSSR Minenergo [Ministry of Power and Electrification], the ODU [Joint Dispatcher Control] of the South, the chief engineers of power associations and electric network enterprises, staff workers of scientific research and planning institutes etc. participated.

The meeting was opened by V. F. Sklyarov, the UkSSR Minister of Power and Electrification.

A. V. Gritsenko, Deputy Minister of UkSSR Ministry of Power and Electrification reported on "Problems of the association, electric network enterprises and power supervision collectives on raising the reliability of the electrical supply and reducing electric power losses in transmitting and distributing it in electrical networks of the UkSSR Minenergo."

The following reports were made at the meeting:

"Problems of the 'Donbassenergo' PEO [Economic Planning Department] on raising the reliability of electrical network operation and reducing electrical power losses in networks in the light of the resolutions at the meeting of the active members of the party and the active electrical industry workers of 15 April 1982" -- by V. A. Zhmurko, "Donbassenergo" PEO director.

A large volume of work was done by the Donbassenergo on developing and modernizing electrical networks.

The operating personnel installed 370,000 stronger insulators on the 35 kv and higher VL [Overhead Line]; replaced 35 tons of conductors on the 35 kv and higher VL, and 9800 tons of conductors on distribution networks; replaced 5470 cubic meters of wooden poles on 35 kv and higher VL, and 26,140 cubic meters in distribution networks.

An increase in generating capacities and the development of electrical networks led to a considerable increase in short circuit currents. A promising way to limit them is the introduction of sicentific research work done by the Khar'kov Polytechnical Institute that specifies grounding the high power transformer neutral through a nonlinear resistance which is a series manufactured concrete pedestal of poles of electrical transmission lines.

The presence of 549 uncompensated sections is a serious source of breakdown. Every year, the TsRMZ [Central Mechanical Repairs Plant] manufactures 10 to 15 continuously adjustable reactances. However, this will not solve the compensation problem in the very near future. Their production should be organized at the Minelektrotekhprom [Ministry of the Electrical Equipment Industry] plants.

One of the conditions of a reliable electric power supply to consumers when operating with reduced frequency -- is the effectiveness of the AChR [Automatic Frequency-Controlled Unloading Device], restriction and emergency disconnect schedules.

The power association meets the AChR volume assigned by the ODU, but for effective emergency disconnect charts, it is necessary that no corrections be made in the approved schedule during the year. This measure will make it possible to use circular disconnects over remote control channels. The 1982 plan for electric network losses is realistic. However, it was not fulfilled in the first quarter (the excess loss was 89.6 million kilowatt-hours). Causes: unfavorable mode of intersystem overcurrents, poor accounting for delivered electrical power, especially to agricultural users etc.

"Method for planning electrical power losses in RES [Rayon Electrical Power Plant] and PES [Mobile Electrical Power Plant] networks*. -- by N. D. Boyko, chief of the Economic Planning Administration of the UkSSR Minenergo.

The work of the power association on organizing the execution of the plan for electric power losses in networks and their reduction above the plan." -- by D. R. Nosul'ko, chief engineer of the "Dneproenergo" PEO.

The 1981 plan for losses was fulfilled by the power association.

A great amount of work was done by the power association to reduce losses: a permanent commission was organized on losses in electrical networks headed by the chief engineer's deputy; an analysis was made of payments by agricultural consumers in the majority of sections and departments of power supervision for all the months of the first quarter of 1982; work was done to find reserves to reduce losses; power supervision and electrical network enterprises organized regular meetings every 10 days on the thrifty utilization of power resources etc. Measures to reduce losses were as follows: improve accounting; introduce computers for billing and analysis; optimize the reactive mode in the networks; improve planning.

*Report materials will be published in ENERGETIKA I ELEKTRIFIKATSIYA, No 4, 1982.

In planning, with an incremental total, contradictions may occur in monthly, quarterly and incremental plans which may qualify as violations of discipline These "violations"-- are mathematical discrepancies in the planning system with respect to the indicator.

It is expedient to consider the question of the possibility of using, as a basic planning indicator, the absolute value of losses, while considering the percentage of losses as an estimated indicator.

"Ways to reduce electric power losses in electrical networks of the 'Khar'kovenergo' PEO" -- by S. I. Krivosheyev, deputy general director of the "Khar'kovenergo" PEO.

The economic effect due just to the installation of compensating equipment at consumers was: in 1981 -- 9.4 million kilowatt-hours as against a plan of 3.7 million; for the first quarter of 1982 -- 1.3 million kilowatt-hours as against a plan of 0.4 million. The power of the compensating equipment installed at consumers increased from 817,500 kilovars by the end of 1980 to 865,400 by the end of 1981, i.e., it increased by 47,900 kilovars in a year.

Work is being done in the association to identify and eliminate poor accounting in electric power use. Some 1842 cases were found in 1981 and 626 cases in the first quarter of 1982.

In this connection, it is planned to intensify the work involving network organizations in this matter.

Further use of generators in the synchronous compensator mode is envisaged. In 1981, seven generators with reactive power of 174 megavars were used. In 1982, generators in the synchronous compensator mode are being introduced at the TETs-4 by means of type PChV thyristor converters which will make it possible to reduce the start-up time of the synchronous compensators from 2 to 3 hours to 5 minutes. This will save fuel and electrical power.

"On organizing work to reduce breakdowns and electrical power losses in the 'Odessaenergo' PEO' -- by Yu. M. Parkhomenko, chief engineer of the "Odessaenergo" PEO. With the new structure of enterprises and rayons of electrical networks, all work on reducing power losses in the power system is in two directions: electric power accounting, analysis, planning and insuring fulfillment of planned tasks on the level of electrical power losses, and the development, introduction and supervision of the fulfillment of measures on their reduction.

This work is coordinated by PEO and PES commissions on reducing electric power losses headed by chief engineers. They include deputy directors of power supervision and the sale of electrical power, deputy chief engineers, chiefs of dispatcher, subscriber services and metrological laboratories.

Managers of electric network and production service enterprises of the association report to the commissions on the introduction of measures taken, and on improvements in losses and accounting of electrical power.

A program is being introduced at present for the structural balance analysis of electrical power losses developed by the Belorussian branch of the "Energoset'proyekt," which should help plan losses in a better way.

"Electric power transmission losses in the OES [Consolidated Power System] of the South network and measures for their reduction" -- by M. K. Pobeygalo of the ODU of the South.

The ODU of the South is carrying out mode and organizational measures to reduce electric power losses in the ODU of the South.

Optimization of the daily schedule for the active load is done taking into account electric power losses in the networks; absolute fulfillment of the ODU schedule facilitates a reduction in losses.

Voltage levels at monitoring points are assigned on the basis of the calculations of optimal voltage modes, reactive power distribution, taking into account corona losses, and of the transverse regulation of the 750 kilovolt transit.

Considerable technical possibilities are available for optimizing the operating modes of the 750 kilovolt transit and of the basic shunting network by the comprehensive utilization of longitudinal-transverse regulation, and cutting-in and cutting-out reactors.

The operating modes of reactive power sources in the power systems, as well as by consumers, play a large role in regulating voltage levels. Therefore, power systems should have operating control of the modes.

"The experience of RES and PES service work on raising the reliability and reducing electric power losses in networks" -- by A. F. Kolomiytsev, director of the Voroshilovgrad PES.

It is advisable to give greater independence to electrical network enterprises in assigning construction-installation work limits and funds for transformer capacity.

To reduce electrical power losses, the PES, jointly with power supervision, carry out a great amount of work, including accounting at consumer connection points, checking the arrangements and schedules for reading billing meters and identifying possibilities of misappropriation of electrical power. As a result, 30 cases were prosecuted to exact payment for over a million kilowatt-hours of electric power. Moreover, engineering-technical services and the RES found 23 burned-out current transformers; 25 transformers not installed or not operating properly; 28 cases where meters were not checked as scheduled, and 19 cases where consumers were connected without being on record (basically temporary consumers -- construction sites). This work will be actively continued and it is planned to begin a systematic check of consumer billing. Information on violations will be sent to the power supervision department regularly.

Many questions demand common guidance. Therefore, we wholeheartedly support the consolidation of the PES and the power supervision department.

"Long-range plans for the development of UkSSR electrical networks and reducing electric power losses in networks" -- by V. P. Garyazha, director of the "Energoset'proyekt' UO GPI [expansion unknown] NII [Scientific Research Institute].

In accordance with developments by the "Energoset'proyekt" UO, the following high priority measures directed toward reducing electric power losses in networks are proposed:

put network facilities in operation on time for transmitting the output of large AES;

place in operation not less than 4000 megavars of compensating devices in the 11th Five-Year Plan period;

improve the characteristics of installed transverse regulation transformers to the required level and implement the system for controlling their modes;

use RPN [Load-Supply Relay] to the maximum and transfer it to automatic control;

use generators from dismantled power plants as synchronous compensators;

introduce an optimal voltage regulation system in the 750 kilovolt network to reduce corona losses.

"PEO and its structural subdivisions work to increase the efficiency of electrical networks operation" -- by V. F. Pavlyuk, chief engineer of the "L'vovenergo" PEO.

The following are the largest measures carried out in 1976-1981 to increase the reliability of operation in networks 35 kilovolts and higher:

some 237 internal connections for the VL 330 kilovolts were installed;

some 3017 cross bars were installed;

some 38 poles were reinforced;

some 1838 wooden poles were replaced by reinforced concrete poles.

At substations of 35 kilovolts and higher, measures were implemented to strengthen the equipment. Low power transformers were replaced by high power; capacitive short-circuit current to ground were compensated for; reliability of the KRUN [Distributing Units for Open-Air Installation] cells and individual types of equipment were increased.

The basic direction for distribution networks in building enclosed transformer substations at sovkhozes and kolkhozes with the installation of AVR [Automatic Standby Cut-In], and introducing automatic control facilities. This will make it possible to provide an electrical supply to agricultural consumers at the required level.

"The experience of power sales work on fulfilling the plan for electric power losses" -- by V. M. Golosnoy, director of the "Kievenergo" Electrical Supervision PEO.

In the Kievenergo Power Supervision Department, a balanced method was introduced for planning, analysis and reporting of electric power losses for oblast departments. Estimated, planned and actual electrical power balances areprepared monthly for each oblast department and for the Power Supervision Department as a whole. Losses are analyzed for each structural subdivision.

The oblast departments prepare balances on the basis of contracts in which all metering points for mutual power transfers are specified. Rayon and interrayon departments are informed of the planned value of useful distribution.

In analyzing balances, special attention is given to the amout of losses in the consumers own networks in absolute units.

The direction of the Power Supervision Department work are the annually prepared measures to reduce commercial losses.

Of great importance in the question of electric power losses in the networks is the proper organization of operating and monitoring the technical conditions of electric power metering devices.

One of the shortcomings of work in a power system to reduce losses is the lack of identity in the structure of network enterprises and the Power Supervision Department.

"Reduction in the technological consumption of electrical power for its conversion and transmission in electrical supply systems of cities." -- by A. A. Shevchenko, chief engineer of the "Ukrgiproenergo" Institute.

The basic source of electric power losses in urban electrical networks are the 6 to 10 kilovolt transformers. It was found that 56% of the transformers operate with a load of 50% and lower.

A considerable systematic asymmetry of loads and voltages, leading to increased losses of up to 1000 volts is observed in urban networks. They may be reduced by making individual phases more precise and their maximum possible distribution by increasing the cross section of the zero conductor of the VL 0.38 kilovolts, using the Y/Z_o windings for transformer power of up to 250 kva and transformers with a ∇/Y_o circuit -- for transformer power of 400 kva and greater, as well as by using special balancing devices.

One way to reduce electrical power losses is changing networks over to a higher voltage.

The use of autotransformers instead of transformers to raise the voltage will reduce electric power consumption for voltage conversion.

A radical means to reduce network losses is compensation of the reactive power, as well as disconnecting part of the network transformers during daily and seasonal load dips, but only if it is possible to disconnect them automatically without using remote control.

"Experience in planning electric power losses in PES networks taking into account the commercial component*" -- by A. T. Shevchuk, deputy general director of the "Vinnitsaenergo" PEO.

"Measures on reducing electrical power losses in agricultural networks" -- by S. D. Mezhennyy, manager of the "Sel'energo proyekt" UO GPI NII, candidate of technical sciences.

On the basis of analyzing measures to reduce losses (MSP) in rural electrical networks, the "Sel'energoproyekt" UO proposes to divide them into three groups according to their positions in the process of production, distribution and consumption of electrical power: the development of electrical networks, control of modes of their operation and control of modes of operation of consumers.

The basic goal of measures of the first group -- is providing the necessary transmitting capacity of the networks with an increase in loads, norm quality of electrical power and reliability of electrical supply.

Measures by the second group are being planned and implemented in the process of operating electrical networks. Their goal is creating conditions for the normal operation of the networks.

The measures of the third group are divided into two subgroups: direct and indirect control of the operating mode by consumers.

On the basis of this MSP classification, taking into account the possibilities of the "YeS [Consolidated System]-Losses" system for evaluating the expected reduction in electrical power losses, a method was developed for the selection of measures. The basic difference between this method and the existing one is a selection of the MSP taking into account the characteristic modes of operation (load schedules) of agricultural consumers and the use of an indicator for reduced electrical power losses. The indicator represents a ratio of the value of reduced expenditures for the realization of any kind of MSP to the unit cost of electric power losses. This method reflects almost the entire process of MSP selection.

"The role of the metrological service in the PEO operation in reducing electrical power losses in networks" -- by B. Ya. Kostyuk, chief engineer of the Ternopol'skiy OPES [expansion unknown].

A production metrological laboratory service to improve the accounting for electrical power was established at the OPES.

*Report materials will be published in ENERGETIKA I ELEKTRIFIKATSIYA, No 4, 1982.

Its duty is to replace and repair three-phase 100-volt meters for all substations 35 kv and higher, RP [Distribution Point], for large consumers and 35 to 110 kv intersystem lines.

To reduce the electrical power imbalance, class 2 meters are replaced by class 0.5 meters and meters at substations. During the past period, 247 such meters were intalled, and it is planned to install 165 more before the end of the year. Meters for the internal needs of all substations of the enterprise were installed where required, under the supervision of, and with the direct participation of the metrologists. This made it possible to allot 3.2 milllion kw-hours additionally for these needs.

The laboratory developed a schedule for checking and installing heaters on the recording meters of consumers.

All work on laying cables and installing meters was done by the personnel of the metrological laboratory.

A considerable amount of work is being done to replace three-phase meters at consumers in the oblast.

"The organization of work on reducing losses in networks of the Umanskiy PES [Peak-Load Electric Power Plant]" -- by M. P. Ryabokon', chief engineer of the Umanskiy PES.

A form of work between the network enterprise and the Power Supervision Department was proposed which should give good results. However, for a final decision, the following is necessary:

that the Power Supervision RES departments plan a single percentage of losses;

that the Power Supervision Department evaluate the work in each rayon individually;

that the oblast Power Supervision Department should finally decide on the question of planning the percentage of losses according to the sum of the network enterprises losses in the oblast (without taking into account losses in the 330 kv networks).

As one version of the coordinated work of the PES and the Power Supervision Department, it is proposed to establish three interrayon sectors (the same as the number of PES in the oblast) at the oblast section of the Power Supervision Department.

A. V. Grutsenko, Deputy UkSSR Minister of Power and Electrification made the closing statement.

On 15 June 1982, a meeting was held at the Rovno AES on "Improvement of the repair industry -- guarantee of high reliability of equipment operation."

The following participated in the meeting: responsible workers of the UkSSR Minenergo, regional directors of power associations, directors of electric power

plants, and power repair enterprises and representatives of the Glavenergoremont [Main Administration on Making Spare Parts and Repairs of Power Equipment], and other organizations.

The meeting was opened by V. F. Sklyarov, UkSSR Minister of Power and Electrification.

The following participants made reports:

"Measures on improving power repairs in the sector" -- by V. I. Barilo, chief engineer of the Glavenergoremont.

During the past year, repair organizations and electric power plants along with scientific research and design organizations did certain work to raise the technical standards of repairing power facilities; new forms of labor organization, and repair technology were introduced, and the level of mechanization was raised.

Repairs of 500 and 800 megawatt equipment units and nuclear electric power plants were assimilated, and a great amount of modernization work was done.

However, the level of power equipment repairs achieved does not meet the requirements fully.

Practically every year, an extremely tense situation arises with completing the volume of repairs. The plan's goals are reduced due to a lack of labor and material resources, or the work schedule is revised to a later date which, in the final account, reflects negatively on the technical condition of the equipment.

The unit repair cost of power equipment and electrical and heat networks increases every year. The lost time of the power equipment in planned repairs is increasing.

In order to raise the technical standards of power repairs and provide for repair servicing of constantly increasing power capacities, the USSR Minenergo prepared, for the 11th Five-Year Plan period, a number of measures of an interindustrial nature:

Introduce 65 million kw of new power capacities to cover the increasing load, to make it possible to dismantle outdated and worn-out equipment, as well as to increase the available reserve capacities;

Supply to the USSR Minenergo the necessary units and parts to replace 9 million kw of equipment whose service life has expired;

Increase the annual supply of units and parts to the amount of 32 million rubles to modernize power equipment to raise its reliability and efficiency;

increase the volume of production and supply of spare parts and the allotment of a number of very scarce materials.

The indicated measures will facilitate the equalization of the annual schedule of repair work, increase the reliability of equipment operation and reduce personnel.

Each enterprise should define more accurately the volume of repair work in its servicing zone and the number of repair personnel. They should outline concrete measures on the more efficient use of personnel, on organizing timely and high quality preparation for repairs, high standards of work organization, doing the work on a sliding schedule, paying special attention to organizing work on the second and third shifts.

Enterprise managers should establish efficient monitoring of the preparation for and the progress of repairs.

"Conditions and prospects for organizing repairs in power associations and raising their efficiency" -- by V. A. Zhmurko, general director of the "Donbassenergo" PEO.

A detailed analysis was given of equipment operation in 1981 and the progress of the repairs comapign in 1982.

The "Donbassenergo"PEO considers that one way to increase the efficiency of repairs is to increase incentives to workers. Therefore, in capital repairs of units, various forms of material incentives are used for the repair personnel.

The PEO is introducing a number of technical and organizational measures to increase the efficiency of repairs and the operating efficiency of heating surfaces:

raise the standard and quality of operation because a large part of the additional volumes of repairs is due to operating faults (temperature overswings, untimely elimination of machine vibrations etc.);

increase the share of plant repairs;

transfer repair personnel to electrical power plants while retaining at the ERP [ezpansion unknown] traveling shops,increasing their number to 1500 to 2000 persons.

Experience in repairing and operating equipment at the Starobeshevskaya and Voroshilovgradskaya GRES indicates that repair personnel subordinate directly to the chief engineer of the plant are more thorough in repairs and take better care of the equipment during operation.

"Raising operating and monitoring standards of the technical condition of equipment" -- by I. I. Magda, general director of the "Dneproenergo" PEO.

The correct evaluation of the reliability and diagnostics of equipment operation of electric power plants plays an important role.

A number of measures is taken to raise the reliability of heating surfaces. Along with the VTI [All-Union Thermotechnical Institute imeni F. E. Dzerzhinskiy], investigations of intensive high-temperature gas corrosion of NRCh [expansion unknown] screens were conducted. As a result of the work done, measures were developed and introduced at all TPP-312 units of the 300 megawatt Zaporozhskaya GRES, which showed positive results. The speed of corrosion was reduced from 5 to 0.5 mm/year and, in combination with forecasting the technical service life of the

metal, and thorough rejection of defective pipes during preventive maintenance repairs made it possible, starting in 1977, to eliminate NRCh damage due to high temperature gas corrosion and reduce the volume of NRCh replacement from 15 to 2 tons (per each boiler).

To increase the service life of the more heat-intensive components of boiler machine heating surfaces, work was developed to improve and strengthen the monitoring of the temperature overswings of the metal:

installing metal temperature recorders at the Pridneprovskaya and Krivorozhskaya GRES;

installing two A-701 machines to record temperature overswings at the Krivorozhskaya GRES;

using the Zaporozhskaya GRES computer for monitoring, analyzing and forecasting the service life of the metal heating surface.

To raise the operating reliability of turbines and their auxiliary equipment, the PEO worked for a number of years on capital repairs, as well as on medium and current repair campaigns.

"Improvement in welding quality as a reserve for raising the reliability of heating surfaces" -- by A. Z. Dereka, chief engineer of the Khar'kovenergo ERP [expansion unknown].

At the end of 1980 at the enterprise, jointly with respective PEO services, specialists of related enterprises at Khar'kov develped a comprehensive program to improve the quality of the welding of heating and pipeline surfaces in 1981-1985.

This program specifies the following:

1. Improve the structure of repairs (as applied to boiler units).

2. Prepare a high quality technological process, including preparatory, assembling and welding operations, and planning this work during the period of the repair campaign.

3. Train skilled welders.

4. Train welding production managers.

5. Strengthen monitoring at all stages of repair of heating and pipeline surfaces.

6. Prepare welding equipment and materials in the volume required in the repair campaign; obtain new equipment and mechanization facilities.

"Plant repair of equipment -- a way to further increase the efficiency of repair service" -- by M. A. Zusmanovich, chief engineer of the "Dneproenergo" ERP.

To improve the industrial plant repair of labor-intensive units and large parts of thermomechanical equipment it is necessary:

1. Order and manufacture 2 to 3 sets of TsND [Low Press. Cylinder] diaphragms for K-300-240 turbines so that freed diaphragms may be used as a replacement fund. They would be repaired in the period between repairs and installed for additions and other work connected with setting the gaps of the flow-through part of the turbine to specifications.

It is advisable to have several sets of all K-300-240 diaphragms in the power association because removing work on repairing from the diaphragms critical path of network schedules will make it possible to free reserves of workers to do other work on the turbine.

2. Organize the introduction of a technology to reclaim segments of turbine steam packing, using the experience accumulated by the "Rostovenergoremont" enterprise.

3. Create an exchange fund of flow-through parts for the OSPT-1150, SVPP-1000-340, PN-1500-340 and PE-600-300 turbine and electric power pumps (a minimum of one set of the flow-through part for each TES). This will make it possible to reduce the repair time of the pumps to that of industrial plant repairs.

4. Establish for electric power plants an exchange fund for steam-water hardware, increase the volume of plant repairs of hardware, equip a section for hardware repairs with the necessary technological instrumentation and raise the quality of repairs.

5. It is necessary to acquire a turret-type of machine tool with a 5-meter diameter faceplate and a large size boring machine tool for machining turbine frame parts and their auxiliary equipment to make industrial-plant repairs of turbine parts and units, such as diaphragms for 3, 4, and stages of TsND and other large units. This will make it possible to save time on special work for machining large units which is done at present at turbine building plants in Khar'kov, Leningrad etc.

Reports on the progress of the 1982 repair campaign, problems faced by domestic power engineering, further reduction in the costs of repairs, raising the quality of repairs and the productivity of labor in repairing power equipment were given by the following: V. A. Oganov, general director of the "L'vovenergo"PEO -- "Organization of repair services of equipment in a power association with an AES;" G. A. Ulanov, deputy chief of the TsKBenergo -- "New norm, technological and design solutions for the manufacture, repair and replacement of heating surfaces;" G. P. Maslak, chief of the Material-Equipment Procurement Administration of the UkSSR Minenergo -- "State of equipment of brigades for repairs of heat surfaces with mechanization facilities and welding equipment;" N. N. Krasnoshtan, director of the Tripol'skaya GRES -- "Ways to improve the reliability of heat surfaces"etc.

V. F. Sklyarov, UkSSR Minister of Power and Electrification made a few closing remarks.

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SYNOPSES OF ARTICLES IN 'ENERGETIKA I ELEKTRIFIKATSIYA', NO 3, JULY-SEPTEMBER 1982

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian, No 3, Jul-Sep 82 p 57

UDC 621.695: 622.929.7

EXPERIENCE IN OPERATING AIRLIFTS IN A SYSTEM OF HYDRAULIC REMOVAL OF ASH AND SLAG FROM THE LADYZHINSKAYA GRES

[Synopsis of article by V. G. Mirgorodskiy, S. Ya. Salyga, N. V. Rusanov and Ye. K. Yakushin, pp 11-12]

[Text] A GZU [Ground Lifting Device] system with airlifts is described. The purpose of using airlifts is explained, along with their basic parameters and shortcomings identified in the process of operation, as well as some application prospects.

UDC 621.311.22: 926.08

EXPEDIENCY OF CHANGING OVER TO AN OPEN ARRANGEMENT FOR DRYING FUEL IN BOILERS OPERATING ON LEAN INFERIOR QUALITY COAL

[Synopsis of article by A. A. Mikhlevskiy, G. V. Zozulya, V. I. Filatov and O. P. Podobed, pp 12-16]

[Text] Results are cited of developments and experimental investigations on evaluating the efficiency of changing over the pulverizing systems of the TPP-210A boilers, burning lean coal, to drying fuel in an open arrangement. It was shown that with the constant reduction in the quality of lean coal, a change-over to an open arrangement for drying would not only increase the productivity of the pulverizing system, but also lead to an improvement in the organization of the burning process, as well as to a considerable improvement in the efficiency and reliability of boiler operation.

UDC 621.187.11

BEHAVIOR OF METAL COMPOUNDS IN THE HIGH TEMPERATURE CHANNEL OF THE SKD [expansion unknown] POWER UNITS

[Synopsis of article by G. V. Vasilenko and G. P. Sutotskiy, pp 16-19]

[Text] The actual data of chemical shops of GRES with SKD units is analyzed with respect to corrosion and the transfer of copper compounds into the condenser-feed channel from the heat exchange apparatus of the regeneration and condenser channel. The special features of the operation of turbine installations in the Khar'kov Turbine Plant imeni Kirov and the LMZ [Leningrad Metal Plant imeni 22nd Party Congress] are described. On the basis of the consideration of thermodynamic data on the solubility of oxides of single- and bivalent copper in water in the 25 to 300°C temperature interval, recommendations are given on the optimal organization of ammonium-hudrazine, hydrazine and neutrally-oxidizing water modes.

UDC 621.311.22: 628.1: 681.2

USE OF SEGMENTAL DIAPHRAGMS FOR MEASURING WATER CONSUMPTION

[Synopsis of and article by V. N. Gorbenko and P. G. Syapin, pp 20-22

[Text] A method is described for measuring water consumption in pipes using segmental diaphragms. A simplified formula is recommended for calculating water consumption, as well as devices for measuring water consumption under operating conditions.

UDC 621.165: 681.5: 621.3.07

EXPERIENCE OF ADJUSTING THE ELECTRICAL PART OF THE K -800-240-3 LMZ TURBINE REGULATING SYSTEM AT THE UGLEGORSKAYA GRES

[Synopsis of article by V. M. Mazin, N. I. Savchenko and Ye. P. Titkov, pp 22-24]

[Text] An arrangement is described for limiting power unit power on instructions from a counteremergency automatic system taking into account the lower limit of the regulating range of the unit. A circuit is shown for the operational change in the live steam pressure ahead of the turbine by means of the BRM [Power Control Unit] and a signaling circuit for the BRM operation in the sliding pressure mode.

UDC 658.264

RAISING THE EFFICIENCY OF REMOTE HEAT SUPPLY

[Synopsis of article by V. V. Fisenko, Z. P. Bil'der, I. A. Ivakhnenko and S. N. Ungaryan, pp 27-31]

[Text] Results are given of experimental investigations of the critical discharge of saturated water through long pipelines, which indicated the possibility of a

considerable resistance reduction for an increase in the transit capacity of the pipelines.

The effect of heat carrier parameters on the technical-economic efficiency of such technology as applied to remote transmission of heat is investigated.

UDC 621.187.127

MAGNETIC PROPERTIES OF POROUS PACKING FOR ELECTROMAGNETIC FILTERS

[Synopsis of an article by A. V. Sandulyak, V. I. Garashchenko, V. M. Arsenyuk and V. D. Dovyanyuk, pp 31-34]

[Text] Magnetization and permeance curves were obtained experimentally for porous packing consisting of balls, pellets, as well as balls and pellets with film covers, a mixture of balls of various diameters and crushed chips. Estimated relationships were obtained to determine the average permeance of porous packing depending upon the permeance of the ferrous metal granules and the density of their packing.

UDC 621.18

CERTAIN PROBLEMS OF TECHNOLOGICAL PROTECTION OPERATION

[Synopsis of an article by V. A. Yershov, and M. A. Zavodnyy, pp 35-37]

[Text] On the basis of experience in introducing and investigating protection, an operational evaluation is given of their modernization during the last period.

The introduction of various emergency unit unloading systems indicates that only systems which require small operational costs for their servicing "adapt" themselves at electric power plants. A method of protection that involves extinguishing the boiler is recommended for introduction. This method was checked out for five years on 200 megawatt units of the Kurakhovskaya GRES. An analysis is given of the operation of the protection devices.

UDC 621.311.22: 621.926

COMPARATIVE ANALYSIS OF INDIRECT LOAD PARAMETERS OF A TUMBLER BALL MILL

[Synopsis of an article by V. R. Kovalyukh, M. B. Gud, Yu. M. Bulavitskiy, N. A. Pekhota and V. V. Taradin, pp 40-42]

[Text] A comparative analysis was made of indirect parameters of control by the method of linear and curvilinear correlation on evaluating two load sensors of a tumbler ball mill: A noise sensor of the ball mass and an inertia-free thermocouple. The closeness of the parameter tie was determined in the form of correlation coefficients. Regression coefficients were obtained.

2291
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PIPELINE CONSTRUCTION

PAPER COMMENTS ON PIPELINE CONSTRUCTION PROGRESS

Kiev PRAVDA UKRAINY in Russian 6 Oct 82 p 1

[Article: "Gas Trunkline"]

[Text] The Urengoy-Uzhgorod route is confidently approaching the western boundary of our country. By the way, it is also approaching the east. On the Carpathian section of the gas pipeline the 14th kilometer of pipe has already been laid. The workers of the Transcaucasus administration of pipeline construction are traveling to meet their colleagues who are stretching the length from the neighboring Ivano-Frankovsk Oblast. They have firmly decided to make the "red junction" on the Ukrainian segment of the route at the end of next year.

Here are the operational data about the course of work on the entire trunkline. Whereas in June a total of 75 kilometers were welded into a line, in July 186, and in August 300. The rate of welding in September was such that the 400 kilometer level was reached. In the last 3 months the rates of insulating and laying of the pipeline have risen 10-fold.

A thousand kilometers is the distance that the length of the export gas pipeline has already been stretched. At first glance this does not seem to be very much, only slightly more than one-fifth of the length of the route of blue fire. But this number is a clear indication of the increased engineering maturity, organizational and technical advances of the builders. They are considerably ahead of the work schedule. Against all bans of the American administration for shipment of equipment they have been obliged to complete laying of the pipes ahead of schedule and to erect the gas-pumping stations.

"Each kilometer of route ahead of schedule!" was the patriotic initiative of the Transcaucasus workers jointly with the collectives of the trust "Ukrtruboprovodstroy" and "Ukrzapadneftegazstroy." The "mountain eagles" as they are called by their Ukrainian collegues are firmly keeping their word. They are winning valuable minutes and hours literally at each kilometer. This became the basis for commitments in honor of the 60th anniversary of formation of USSR, to complete 10 days ahead of the plan the work on the 60-kilometer section from Bogorodchan to the crossing of the Svicha river.

The work rates on the Ukrainian segment of the route are increasing. The steel bed of the gaspipeline reached 250 kilometers on 1 October. Almost 114 kilometers of pipe were laid into the trench and filled. The weekly rate of the workers is about 15 kilometers. This is a good result. Nevertheless acceleration is required, the more so since not all the construction organizations working in the Ukraine are rapidly expanding their facilities. The preparation of the Voronezh workers in the Suma and Poltava Oblast and the Leningrad workers in the Poltava and Cherkassa Oblasts is clearly being delayed. Laying operations have essentially not been started on the 290 kilometer length between markers "3368" and "2658." There are enough pipes here, 134 kilometers, but preparation of the lengths and the shipment to the route is going extremely slowly. The builders of the Bryansk trust are lagging.

Of course this situation is alarming. A short time will pass and the good weather days will be replaced by the autumn bad weather. Then it will be much more complicated to ship pipes and equipment, to dig trenches, to weld and to lay. The leaders of the appropriate ministries and departments, the oblast headquarters for coordinating work on the route must give their word. There must be a precise schedule on each section and it must be strictly observed.

It is important to reinforce the organizational measures with mass-political work, specific and purposeful. This is how it is done in Ivano-Frankovsk. The headquarters created here in the Ukrainian Communist Party obkom headed by the secretary of the obkom P. T. Barchek coordinates the actions of the planners, construction organizations and the customer. Temporary party and Komsomol groups have been set up on the production line of the route. The obkom and its sections, party raykoms help to organize socialist competition, participate in tallying of results, promote to publicize and clarify it, and disseminate the experience of the best workers. The experiences of the leading brigade of welders of L. G. Timus', excavators operators S. A. Martirosyan, bulldozer drivers of B. I. Kazyr and others, for example, have become common knowledge to all builders of the Ivano-Frankovsk section. The party rayokms and party offices of the construction site need to see that every valuable initiative, every useful suggesting coming from the workers is supported and is introduced without the slightest delay. In the final analysis this will accelerate the start-up of the gas pipeline. The joint decree of the UkSSR Council of Ministers and the Ukrainian Soviet of Trade Unions clearly define the tasks of the trunkline builders, the measures of material and moral incentive for builders of the competition. The decree prepares the labor collectives to achieve an early start-up of the gas pipeline. The party, trade union and Komsomol committees need to widely develop organizational and ideological work with regard for the schedules set in the decree. Of cours the primary attention should be focused on guaranteeing the start-up of the line section extending 1,146 kilometers and the start-up compressor stations "Grebenkovskaya" and "Barskaya."

That mood, that selflessness that the creators of the transcontinental trunkline are working with are gladdening. Perhaps the fact that many welders and pipelayers are holding pieces of chalk in their work outfits is insignificant. The chalk is to inscribe: "Yet another butt-joint!," "Each kilometer ahead of schedule. This is our response to Mr. Reagan!," "We will finish the gas pipeline ahead of schedule!" And at the bottom the signature as proof of the personal participation in the construction site of the century.

It is remarkable that this unique relay race has now passed to the subcontractors, the workers of the industry enterprises who are supplying equipment for the gas pipeline. Competition is also developing here for early fulfillment of the orders of the builders. The Kharkov and Suma machine builders, and transformer builders of Zaporozh'ye are giving especially great assistance to the route workers.

Experienced, highly educated, technically strong spirited people are working on the Urengoy-Uzhgorod route. There is no doubt that the task of the party to create the world's longest gas pipeline will be fulfilled by them with honor. The "red junction" will be welded ahead of schedule!

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PIPELINE CONSTRUCTION

VOLGA CROSSING OF PIPELINE DESCRIBED

Moscow IZVESTIYA in Russian 14 Oct 82 p 1

[Article by Yu Alayev, non-staff IZVESTIYA correspondent: "On the Bottom of the Volga, Report from the Gas Pipeline Route"]

[Text] A short command on the walkie-talkie and the winch was switched on at the opposite bank, and the multiple-strand steel cable was stretched above the 2-kilometer mirror of the river. After a one second pause, six pipe-layers immediately immediately started their motors, and the first 200 meters of pipeline supported by them crept toward the water: laying of the Urengoy-Pomary-Uzhgorod gas pipeline on the bottom of the Volga had begun.

The head of the Kazan' administration of underwater engineering operations, Vladimir Georgiyevich Pelipenko continuously looks at the cable connecting the Mariy shore at the Zvenigovo regional center with a nameless point on the right Chuvash bank. He knows that there a section between the Volga and the Sura, the route workers of "Kuybushevtruboprovodstroy" are extending the gas pipeline a kilometer daily. Day by day increasing the speed of operations, the combined production line of Hero of Socialist Labor, I. Shaykhutdinov, from "Tatnefte-provodstroy" trust is advancing to the left bank. The inverted siphon across the Volga is the central link between them.

Many times before, pipelayer machine operators N. Naumov and P. Kazakov, welders V. Gryzunov and V. Matveryv and many of their comrades have pulled the inverted siphons through dozens of large and small rivers of the Volga-Kama basin and the Volga itself. For them an hour flies like a minute, and on the shore welding has begun to sparkle: the first butt-joint -- and the body of the pipeline was increased by another two meters. Twilight had already deepened more perceptibly when the cable went underwater, opening up traffic for ships; then, senior diver from the station, F. Shaydullin followed into the depth. Finally, the transmitter reports to Pelipenko: "Shaydullin reports everything is normal. The pipe is lying correctly". The Kazan' underwater workers will work for ten more days without stop before the red flag will soar high on the steep right bank in honor of yet another labor victory.

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PIPELINE CROSSING OF VOLGA RIVER CONTINUES

Moscow TRUD in Russian 14 Oct 82 p 1

[Article by Ye. Ukhov, in-house correspondent of TRUD: "Trunkline Crosses the Volga"]

> [Text] Laying of the inverted siphon across the bed of the Volga has started 7 months ahead of schedule on the route of the export gas pipeline Urengoy-Pamary-Uzhgorod at the Mari city of Zvenigovo.

The hour has now come for which the installers, welders, machine operators, crews of the hydraulic dredges and divers have been preparing for so intensively and carefully. The command "begin!" was heard above the gray ripple of the Volga. The 300-ton winch began to move and the cable which was as thick as an arm strained. At times the motors of the pipelayers roared. The gigantic nose of the inverted siphon, as though unwilling, began to move unnoticeably for the eyes. Gradually the "head" was lowered into the water, and now the entire length was creeping into the river, dragging into the depth hundreds of tons of steel and pig-iron sinkers.

The nomadic microcity of the Kazan' specialized administration of underwater engineering operations with its single street Urengoyskaya was set up at the 2,242nd kilometer, in the middle of the transcontinental trunkline. Having arrived here a week earlier, I found the head of the administration V. Pelipenko and the foreman of the section M. Agapov disturbed. Until now the working of the autumn trench had gone according to schedule, but before actually reaching the right bank, the cutter of the hydraulic dredge ran up against a thick bed of clay. Trying to penetrate it by standard equipment only stirred up the water. They had to make an emergency shipment from Kama of a more powerful mechanism in order to work the clay monolith. The maneuver was quite justified. But in order not to disrupt the "start-up", it was necessary to make up for the lost time, and to tighten up the already strict schedules for the remaining underwater operation.

The senior diver Farkhat Shaydullin entered the foreman's room, rustling a wet raincoat in a thick diver sweater. Taking off his hood he sat at the table and with a rush was engrossed in calculations. Farkhat is an experienced diver with an underwater record of almost 3,500 hours (3 months in a wet suit!) and his opinion for the administration head was authoritative. Selecting the trench for the gas pipeline, the senior diver measured with his lead soles the bottom lengthwise and crosswise, feeling the side and edges of the trench, knowing all of its peaks, bends and basins.

On the way to the shore where they were awaited by a motor boat in order to rush to the hydraulic dredge which was visible beyond the shroud of rain, Vladimir Georgiyevich told me that this is the forth crossing by count for the administration collective. Before this there were even longer inverted siphons: the famous oil pipeline "Druzhba" at Syzran' stretched through a reservoir with a 5-kilometer mirror. Here the inverted siphon was half the length, but then the pipe section was unique and with a record weight of 6,000 tons; this was the first time he had to pull such a bulky thing under water.

"We are 7 months ahead of schedule. The crews of the underwater builders headed by Kh. Khasanov, V. Semenov and V. Iskanderov have removed 630,000 m^3 of ground from the bottom, and have brought the trench for the gas pipeline to the planned marker. The trench in places has been deepened to 16 meters. Submerged logs and other underwater 'surprises' were a special obstacle."

The beachhead on the left installation bank is similar to a normal construction site: the earth has been chopped up into cabbage by the caterpillar tracks of the heavy tractors, piles of sand and gravel are high. The structure of the inverted siphon is similar to the assembly of a house with pre-fabricated sections. Only these sections are 200 meters long and weigh 400 tons each. All 12 were made 70 kilometers from here, at the mechanized stand in Kazan'.

The underwater bridge across the "main street of Russia" will be 2-track. Siberian gas from Zvenigovo will dive into the 2 steel trunks, and crossing the river obstacle, will again merge into a common channel. A wide clearing has been cut on the steep wooded slope of the right bank. At this site, the integrated production line of L. Mikhel'son from "Kuybyshevtruboprovodstroy" will connect their section of the pipeline to the inverted siphon. This line is now working on the territory of Chuvashya.

The inverted siphon is lowered into the trench meter by meter. The submersion occurs according to plan, this is followed by the divers and the all-seeing instrument of the profilograph which is installed on the cutter. The collective has committed itself to complete the most complicated hydraulic engineering operation in the shortest time. There is yet another detail. Conquest of the largest water obstacle on the route of the Siberian gas will not be an obstacle for Volga captains. The river will not have to be closed to traffic for even an hour.

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PIPELINE CONSTRUCTION IN TAMBOV OBLAST DESCRIBED

Moscow IZVESTIYA in Russia 8 Oct 82 p 1

[Article by V. Romanyuk, special IZVESTIYA correspondent: "Junction at the Verditsy river"]

> [Text] On the Tambovskiy segment of the route, over 100 kilometers of gas pipeline have been welded into a length ahead of schedule. The route workers of the trust "Soyuzgazspetsstroy" decided to complete the line section not by 15 Dec as stipulated by the previously adopted commitments, but by 7 Nov 1982.

The Tambov segment is not customarily considered to be especially complicated. However, even here the builders are faced with overcoming numerous small rivers with their unsteady lowlands, reservoirs, and crossing under the railroad bed 3 times. Here there is a high level of ground water, therefore they have to ballast the pipeline with the help of reinforced concrete weights,

Several days ago welding and filling of the junction from Algasov in the east of the oblast to the Verditsy were completed. On a large part of this 50-kilometer crossing, a full cycle of recultivation work was done. The local services succeeded in plowing the land and sowing winter crops. Flying by helicopter over the route, I saw how the black strip of earth was shaded more densely with emerald green of plantings. Quite recently the "Kirovets" were rumbling here, the pipe length carriers were crawling across the steppe, and constellations of welding fires blazed.

On the other side of the Verditsy, the route is being laid by a team based in the region of the Staroyur'yevo settlement. In recent days the builders stormed the 5-kilometer gap between the east and west sections. It was important in the fine weather weeks remaining before the bad weather to carry out the work on the most remote sections, to supply the pipes to the entire route, and gradually to gather the equipment for the finish crossing.

We flew to the Parskiy corner together with the head of the section S. Startsev and the head of the laboratory for monitoring welded connections Yu. Yavkin. They were disturbed because in certain places the gas pipeline did not lie on the bottom of the trench, although the ballasting had been done and hundreds of tons of "overweights" had been hung on the pipe. It was found that everything was in order with the welding, but simply the trench had become silted

up and it was required to again send the bucket excavator to the muddy place. The excavator operator I. Nedoshitiko had already set up his swamp vehicle at the edge of the trench, and a mountain of black silt rose near by.

The advantages of the line method of working in construction with the gas pipeline are well known. Recently the brigades of truck drivers of V. Tyukin and V. Marsh'yan involved with hauling lengths to the route switched to the single contract with evaluation of work according to the coefficient of labor participation. Labor productivity in the collectives immediately rose by 20-25 percent. The leading method of organizing work helps to accelerate the shipment of pipes for the entire length of the gas pipeline.

What the builders were waiting for and hoping for occurred in the crossing of the Verditsy river: 100 kilometers of the pipe were welded into a length. It is valuable that by advancing a kilometer of the route every day, the builders did not lose sight of the main goal -- to join scattered sections into a length, and did not leave crossing of the difficult sections "until later."

I must say that the victory gained here was not the result of some all hands job or overstresses which are often written about in the Western press. The 5th administration of the trust "Soyuzgazspetsstroy" is not named experimental by accident. This is a skilled collective which has extensive experience in making gas pipelines. Its brigades check the latest equipment which comes to the route in abundance, "breaks in" the leading methods of organizing labor. Many route workers have more than a thousand kilometers of gas pipeline behind them. The section of A. Rainskiy, for example, which only 2 months ago landed on the Tambov earth, before this participated in construction of the Urengoy-Petrovsk gas pipeline and even earlier in the construction of three parts of the Punga-Vuktyl-Ukhta trunkline. During these years they worked out a precise organization of work. Unification of people involved in cleaning the route and digging the trenches, overhead and rotating welding, insulation and ballasting of the pipes, filling and recultivation the land made it possible to do with a smaller number of workers.

On the route we became acquainted with A. Borisov, foreman of the integrated brigade. Wearing a new padded jacket, cap pulled down to his eyes, he stood at the very edge of the trench and supervised the centering of the next section of the pipes to be joined on the rotating stand. The day was sunny, although it was windy, and the pipelength carriers were operating well. Botisov hopes to make 15 butt-joints during a shift.

A. Borisov is passionate by nature, at times hot-tempered, but in the brigade he is a true leader, and the comrades value highly his working skills, his ability to come to aid where it is needed the most. He himself, like many workers of his brigade, has worked on the routes of the gas pipeline for a good dozen years. He is 42, and it would seem that he has been included among the veterans early, but from his worker biography one can study the history of construction of gas trunklines in the country, in any case in the last decade.

The field city near Staroyur'yev has only begun to take shape. But a cafeteria has been constructed, there are potato and fruit warehouses, a heat line is being laid which will provide heat for the houses. An agreement has been reached with local organizations about showing new films in the city, holding book-illustrative expeditions. And what is especially important, putting the children of the builders in the kindergartens of the regional center.

During our stay here at the sports base of the local professional-technical school, games were held of the trust "Soyuzgazspetsstroy" dedicated to the 60th anniversary of the formation of the USSR. The chairman of the union committee of the trade union of the trust V. Sizov said that the games assembled 112 of the best athletes. The competitions were held for popular type of sports, volleyball, soccer, ping pong, chess and heavy-weight athletics.

Extension of the route has again affected many human fates. V. Baysarin, a Mari, came to the route from the city of Tuymazy. He worked for 7 years at the plant "Khimmash," and maintained the unit of semiautomatic welding on which vessels and shells were welded. When he found out that the group also used welding units, he went off. His wife Nadya who is now also working on the route and his 2 children Lena and Alesha also went with him. I was able to observe how Baysarin controls the welding unit calmly and confidently, just as in the plant shop.

The builders are concerned not only with the route. Those temporary difficulties which they create for the rural workers are compensated for by roads with hard pavement and specific help. A pit has already been dug here in the Staroyur'yevskiy Rayon for the foundation of the future bakery: the route workers helped to build a bridge across the Sushtanka river, having filled 2000 m^3 of the ground into the dam. In the Morshanskiy Rayon, 3 pits were dug for construction of houses, and they help the rural machine operators with spare parts.

But they themselves need more efficient help on the part of the Tambov organizations. This primarily concerns continuous supply of fuel and lubricant materials to the Morshanskiy and Staroyur'yevskiy bulk plants. The Tambov metal base and the base of the administration of material-technical supply could produce a single output of materials needed, in particular, for start-up of the 2 boilers and preparation of residential buildings for operation under winter conditions. The field cities need skilled help in supplying a reliable telephone line. In the field settlement Aleksandrovskiy, I was shown the hewn bath-house and swimming pool not without pride. But this is a rarity on the route, although industry has developed the manufacture of a a disassemblable bath-house with a swimming pool.

The work orientation of the builders must be reinforced without fail with specific concern of the departments and local agencies. There are no trivial details on the route. Everything that retards the line must be decisively eliminated.

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